The Welding Engineer

Reg. U. S. Pat. Office

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If you employed an expert efficiency engineer to select your welding and cutting apparatus he would choose

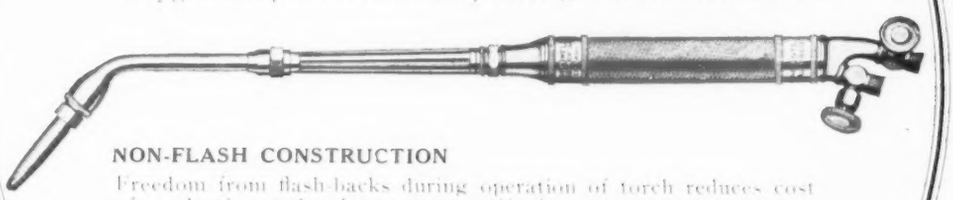
"TORCHWELD"

When you install TORCHWELD APPARATUS you lower your cost of production

Because

It's a SAFETY-FIRST proposition right from the start.

TORCHWELD TORCHES operate on evenly balanced pressures—consume equal quantities of acetylene and oxygen and possess the most perfect gas mixer ever devised.



NON-FLASH CONSTRUCTION

Freedom from flash-backs during operation of torch reduces cost of production and upkeep expense. You're always insured against hard to machine welds.

PERFECTION OF DETAIL

Many "little things that count"—perfect balance—swinging heads—correct length extensions—flexible welding tips.

Now about TORCHWELD efficiency. All torches cost good money; some are more efficient than others; you're sure to get maximum results when you buy TORCHWELD PRODUCTS. They're guaranteed to satisfy—money back if they don't.

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High grade welding and cutting apparatus. Portable or generator outfits. Welding materials, fluxes, supplies and accessories.

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PAINLESS DENTISTRY *for* GEARS

YOU wouldn't discharge the foreman if he lost a molar. Why scrap a gear just because of a few broken teeth? Why not fill in with new metal—as shown here—and recut? This is only one of a thousand ways to oxweld and reduce costs. Ask us to send you the Bulletin that tells about the advantages of oxwelding in your industry.

Oxweld Acetylene Company

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World's Largest Maker of Equipment for Oxwelding and Cutting Metals

ATTENTION

We Want Several

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For Our

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Our instruments are used in numerous first-class welding and cutting shops with most gratifying results.

HYDREX ENGINEERING CORPORATION

Hutchinson Bldg. Buffalo, N. Y.

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Correct Preheating Means Successful Welding

Preheating is essential to successful welding, because it distributes expansion stress evenly, prevents internal strains, hard spots, chills. Cuts the cost of time and labor.

Hauck Preheaters are rapidly being adopted by the progressive welder because they are easily handled, clean and economical. The use of a Hauck Preheater on any welding job, whether large or small, insures a saving of 75% in the cost of acetylene, gas and time. Metal around the weld is thoroughly heated before the welding flame is applied.

Furthermore, a Hauck Preheater, being a compact and portable means of preheating permits welding to be done in place without dismantling. The flame can be instantly regulated to any desired size.

Made in two types; one hand pump, to burn kerosene oil, and one compressed air, burning fuel, crude or kerosene oil.

From time to time, we issue very interesting literature about preheating. Ask us to put you on our mailing list. *Will gladly send you copies free.* You will find them of great value in your work.

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Prices—Right
Delivery—From Stock

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IRVINGTON, N. J.

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2 All accessories and supplies of the best quality.

3 The most completely equipped welding shop in New York City and capable of handling the largest castings or any quantity of manufacturers work—men and apparatus supplied for outside work.

4 A large stock of acetylene and Oxygen always on hand to supply our trade at the lowest market prices.

5 Everything needed for oxy-acetylene work we supply.

K-G Welding & Cutting Co.

Incorporated

556 West 34th St., New York City

Buyers' Index

Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

ACETYLENE (Compressed in Cylinders)
Commercial Acetylene Welding Co.
Universal Oxygen Co.
Prest-O-Lite Co.
ACETYLENE CYLINDERS
ACETYLENE GENERATORS
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Universal Oxygen Co.
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International Oxygen Co.
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HARDENING FURNACES
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International Oxygen Co.
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International Oxygen Co.
Universal Oxygen Co.

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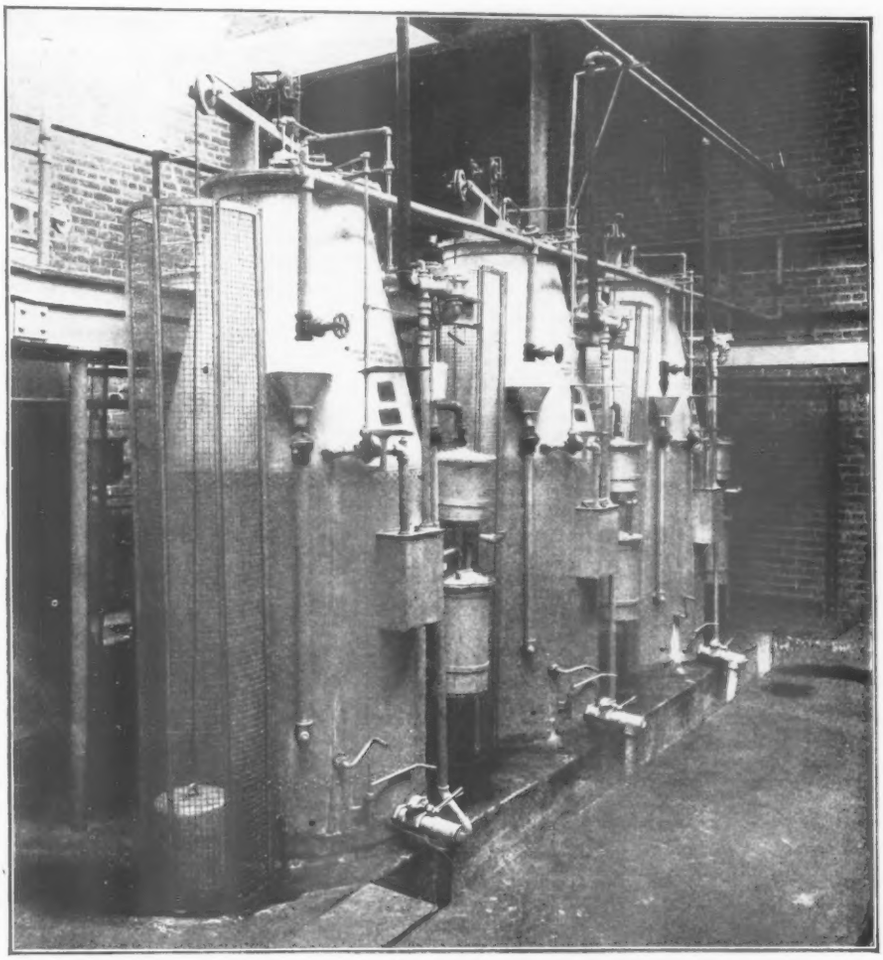
Acetylene is the only efficient gas employed for both cutting and welding of metals. For shop operations and for yard use, with fixed stations, the most economical and satisfactory supply is by generation of acetylene on the premises as it is required, piping the gas under working pressure directly to where it is wanted, avoiding transportation delays, costs, and handling of acetylene tanks, and the necessarily higher cost of the gas. For outside work where portable apparatus is required, the portable acetylene tanks are invaluable.



This illustration shows a bank of three 300 lb. carbide capacity Davis-Bournonville acetylene pressure generators, which is one section of a twelve generator installation in a metal working plant.

Davis-Bournonville generators are made in several sizes and are frequently installed in batteries of from two to twelve of the largest size. Automatic in operation, and with no additional storage of free acetylene, they provide the highest efficiency in acetylene production. Davis-Bournonville apparatus comprises the widest range of equipment for the production, distribution and application of acetylene, oxygen and hydrogen for welding and cutting.

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Buffalo	Cleveland	Jersey City	Montreal	St. Louis	Toronto

DAVIS-BOURNONVILLE CO. DAVIS APPARATUS NEW YORK-CHICAGO

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Electrolytic Oxy-Hydrogen Laboratories, Inc.
International Oxygen Co.

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Superior Oxy-Acetylene Machine Co.

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Bermo Supply Co.
Buffalo Dental Mfg. Co.
Federal Brass Works.
General Welding & Eqpt. Co.
K-G Welding & Cutting Co.
Superior Oxy-Acetylene Machine Co.
Torchweld Equipment Co.

NICKEL FLUX
American Flux Co.

OIL BURNERS (Preheating)
Air Reduction Sales Co.
Gas Products Assn.
Oxweld Acetylene Co.
Superior Oxy-Acetylene Mach. Co.

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Burdett Oxygen Co.
Gas Products Ass'n.
International Oxygen Co.
The Linde Air Products Co.
Swift & Co.
Universal Oxygen Co.

OXYGEN AND HYDROGEN GENERATING EQUIPMENT
Burdett Oxygen Co.
The Electrolabs Co.
Gas Products Assn.
International Oxygen Co.
Universal Oxygen Co.

OXYGEN CYLINDERS

PIPE WELDING
Metal & Thermit Corp.

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PRESSURE GAUGES
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Federal Brass Works.
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Harris Calorific Co.
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National Gauge & Eq'p't Co.
Oxweld Acetylene Co.
Smith's Inventions, Inc.
Superior Oxy-Acetylene Machine Co.
U. S. Gauge Co.
Torchweld Equipment Co.
United States Welding Co.
Universal Oxygen Co.

REGULATING VALVES (Acetylene)
Air Reduction Sales Co.
The Bastian-Blessing Co.
Bermo Supply Co.
Burdett Oxygen Co.
Davis-Bournonville Co.
Federal Brass Works.
Hauck Mfg. Co.
Harris Calorific Co.
International Oxygen Co.
The Imperial Brass Mfg. Co.
K-G Welding & Cutting Co.
Oxweld Acetylene Co.
Smith's Inventions, Inc.
Superior Oxy-Acetylene Machine Co.
Torchweld Equipment Co.
United States Welding Co.
Universal Oxygen Co.
Universal Regulator Co.

REGULATING VALVES (Hydrogen)
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Burdett Oxygen Co.
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International Oxygen Co.
The Imperial Brass Mfg. Co.

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Smith's Inventions, Inc.
Torchweld Equipment Co.
Universal Oxygen Co.

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Smith's Inventions, Inc.
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Universal Oxygen Co.
Universal Regulator Co.

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Henderson-Willis Welding & Cutting Co.
International Oxygen Co.
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Prest-O-Lite Co.
Smith's Inventions, Inc.
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The Thermalene Co.
Torchweld Equipment Co.
United States Welding Co.
Universal Oxygen Co.

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Bermo Supply Co.
Burdett Oxygen Co.
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Federal Brass Works.
Henderson-Willis Welding & Cutting Co.
The Imperial Brass Mfg. Co.
K-G Welding & Cutting Co.
The Alexander Milburn Co.
Oxweld Acetylene Co.
Prest-O-Lite Co.
Smith's Inventions, Inc.
Superior Oxy-Acetylene Machine Co.
Torchweld Equipment Co.
The Thermalene Co.
United States Welding Co.
Universal Oxygen Co.

TORCHES (Oxy-Hydrogen Cutting)
Air Reduction Sales Co.
The Bastian-Blessing Co.
Harris Calorific Co.

TORCHES (Oxy-Hydrogen Cutting) Cont.
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Burdett Oxygen Co.
Davis-Bournonville Co.
Federal Brass Works.
Harris Calorific Co.
Henderson-Willis Welding & Cutting Co.
International Oxygen Co.
The Alexander Milburn Co.
The Imperial Brass Mfg. Co.
Torchweld Equipment Co.
Oxweld Acetylene Co.
Prest-O-Lite Co.
Smith's Inventions, Inc.
Superior Oxy-Acetylene Machine Co.
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Burdett Oxygen Co.
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Harris Calorific Co.
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Universal Oxygen Co.
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Air Reduction Sales Co.
Burdett Oxygen Co.

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WELDING APPARATUS
See also "Torches."

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National Electric Co.
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International Oxygen Co.
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Chicago Eye Shield Co.
International Oxygen Co.
Torchweld Equipment Co.

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Air Reduction Sales Co.
Burdett Oxygen Co.
International Oxygen Co.
Universal Oxygen Co.

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Bierman-Everett Fdy. Co.
Burdett Oxygen Co.
Central Steel & Wire Co.
Federal Tool & Alloy Steel Corp.
International Oxygen Co.
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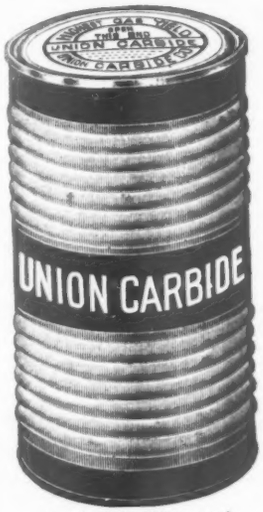


Packed in Blue and Gray Drums

Union Carbide Sales Company

New York City, 42nd St. Building — **Chicago, Ill., Peoples Gas Building** — **San Francisco, Cal., Kohl Building**

SOLE DISTRIBUTORS OF

UNION CARBIDE

"World's Best Quality—Highest Gas Yield"

For Oxy-Acetylene Welding Plants

Contractors' Flare Lights, Torches and Private and Municipal Lighting Plants

"Union Carbide" is packed in 100-lb. blue and gray drums marked conspicuously, "UNION CARBIDE."

The following sizes are carried in stock in 100-lb. drums:

3½ x 2 in. —a large size.

2 x ½ in. —a medium size.

1¼ x ⅜ in. —an intermediate size.

¼ x 1/12 in. —finely crushed size.

Union Carbide in the Generator sizes above listed will be shipped direct to consumers from a **Union Carbide Sales Co.** warehouse at any one of the following points where large stocks are kept on hand:

ALABAMA
Birmingham—1916 Morris Ave.
Mobile—16 S. Commerce St.
Montgomery—114 N. Perry St.
ARIZONA
Phoenix—42 S. Central Ave.
ARKANSAS
Fort Smith—109-123 So. Ninth St.
CALIFORNIA
Fresno—932 H St.
Los Angeles—639 Gibbon St.
Sacramento—1523-31 Front St.
San Diego—326-336 Fifth St.
San Francisco—Kohl Building.
COLORADO
Denver—Nineteenth and Wazee Sts.
CONNECTICUT
Hartford—412 Trumbull St.
DISTRICT OF COLUMBIA
Washington—Maryland Ave. and 9th St., S. W.
FLORIDA
Jacksonville—515 W. Bay St.
Tampa—107 Madison St.
GEORGIA
Atlanta—Cor. Haynes and Rhodes Sts., P. O. Box 1594.
Savannah—Ogeechee Canal, South of Bay St., P. O. Box 78.
ILLINOIS
Chicago—Peoples Gas Bldg., Michigan Blvd.
Decatur—133-147 W. Williams St.
East St. Louis—600 Walnut Ave.
Peoria—100-110 Edmund St.
Monmouth—124 E. Archer Ave.
Marion—315 S. Granite St., Box 747.
Quincy—222 S. Eighth St.
Streator—702 East Elm St.
INDIANA
Evansville—1601 Illinois St.
Fort Wayne—2216 Broadway.
Indianapolis—110-112 S. Alabama St.
Terre Haute—921 Wabash Ave.
IOWA
Davenport—118 Harrison St.
Des Moines—3rd and Elm Sts.
Dubuque—8th and Washington Sts.
Fort Dodge—10 S. 8th St.
Ottumwa—207-9-11 S. Washington St.
Sioux City—925 Fourth St., P. O. Box 398.
Waterloo—1209 E. 4th St.
KANSAS
Pittsburg—109 W. Third St.
Salina—154 So. 5th St.
Wichita—721 Beacon Building.
KENTUCKY
Louisville—126 E. Main St.
Middlesboro—1701 Cumberland Ave.
LOUISIANA
New Orleans—819-21 Julia St.
MAINE
Portland—11 Exchange St.
MARYLAND
Baltimore—19 E. Lombard St.
Cumberland—1 N. Liberty St.
Salisbury—Opp. Fulton Station.
MASSACHUSETTS
Boston—(See Cambridge "A.")
Cambridge—241 Albany St.
Springfield—Napier St.
MICHIGAN
Detroit—Grand River and Lorain Ave.
Grand Rapids—500 Shawmut Ave., N. W.
Hancock—First National Bank Bldg.
Iron Mountain—215 E. A St.
Jackson—172 South Water St.
Muskegon—43 No. Terrace St
Saginaw—1830 No. Michigan Ave.
Sault Ste. Marie.
MINNESOTA
Minneapolis—334 N. First St.
Virginia—413 Chestnut St.
MISSISSIPPI
Vicksburg—1312 Washington St.
MISSOURI
Kansas City—1316-1318 W. Eighth St.
St. Joseph—920 S. Sixth St., Sta. "A."
St. Louis—(See East St. Louis, Ill.)
NEBRASKA
Omaha—1007-9-11 Jones St., Union Sta. P. O.
NEW JERSEY
Camden—West and Clinton Sts.
Jersey City—554-56 Henderson St.
NEW YORK
Albany—Montgomery and Colonie Sts.
Binghamton—21 Jarvis St.
Buffalo—1336 Genesee St.
Geneva—Exchange St. and Railroad Pl.
Hurleyville.
Jamaica—11 New York Ave.
Kingston—O'Neil St., near Broadway.
New York.
Niagara Falls.
Poughkeepsie—Smith St. and N. Y., N. H. & H. R. R. Tracks.
Utica—135 Hotel St.
Watertown—438 Court St.
Whitehall—22 Main St.
NORTH CAROLINA
Charlotte—Post Office Box 777.
Raleigh—107 Fayetteville St.
Wilmington—Room 16 Masonic Temple, 13 N. Front St.
NORTH DAKOTA
Fargo—17 Broadway.
OHIO
Canton—400 Walnut Ave. S. E.
Cincinnati—67 Plum St.
Cleveland—601 The Citizens' Building.
Columbus—330 Dublin Ave.
Dayton—812-828 E. First St.
Lima—338 East High St.
Mansfield—40 West Third St.
Steubenville—324-343 North 7th St.
Toledo—414 S. Erie St.
Zanesville—Main and Second Sts.
OKLAHOMA
Oklahoma City—27-29 E. Grand Ave.
Tulsa—1—11 No. Boulder St.
OREGON
Portland—Fifteenth and Hoyt Sts.
PENNSYLVANIA
Beaver—359 Beaver St.
Du Bois—Webber Ave. and Franklin St
Erie—1426 Chestnut St.
E. Greensburg—Clark and George St.
Harrisburg—627 Walnut St.
Johnstown—Messenger St. & B. & O R. R.
Pittsburgh—1202 Chamber of Commerce Building.
Pottsville—Railroad and Sanderson Sts.
Scranton—Penn Ave. and Vine St.
Shamokin—5th and Walnut Sts.
Williamsport—Canal and Court Sts.
SOUTH CAROLINA
Charleston—No. 3 Liberty St.
TENNESSEE
Chattanooga—627 Volunteer State Ins. Bldg.
Knoxville—426 West Depot Ave.
Memphis—671 South Main St.
Nashville—105-107-109 Broadway.
TEXAS
Dallas—802-810 Cadiz St.
El Paso—900 E. Overland St.
Houston—Baker and Cedar Sts., Box 745.
San Antonio—Cor. Leal and N. Salado Sts.
Waco—13th and Mary Sts.
UTAH
Salt Lake City—118 W. Second South St.
VIRGINIA
Lynchburg—1324 Commerce St.
Norfolk—513 Front St.
Richmond—18th and Cary Sts.
WEST VIRGINIA
Bluefield—195 Roanoke St.
Charleston—Broad St. and K. & M. R. R.
Fairmont—"A" Street.
Huntington—820 3rd Avenue.
WASHINGTON
Seattle—1103 First Ave.
Spokane—646 Peyton Building.
WISCONSIN
La Crosse—Front and King Streets.
Madison—513-19 Williamson Street.
Milwaukee—120-124 Jefferson St.

We recommend our customers to **select** from the list, the **city** from which the quickest delivery and lowest freight rate can be obtained, **and address their orders to "Union Carbide Sales Company"** at the distributing point selected **accompanied by remittance.**
Please address request for information or special correspondence to either the New York or Chicago office.

No Other Oxy-Welding Gauge Has Them

Patented

The Solid Cast front behind the dial, and pressure relieving back—both essential for absolute safety—are typical of the U. S. Oxy-Welding Gauges only.

But these aren't the only reasons why approximately 90% of the trade insist upon them.

Catalogue W W goes into full details. May we send it to you?

U.S. GAUGE CO. N.Y.

United States Gauge Co.

67 Wall Street, New York

Chicago Boston Detroit Philadelphia New Orleans San Francisco Montreal

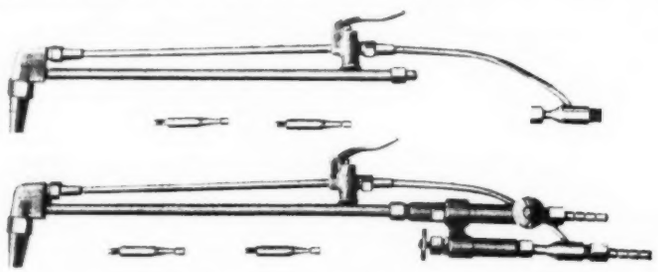
U.S. GAUGE CO. N.Y.

Get Smith's Acetylene Soldering Coppers

They will quickly pay their cost in time and trouble saved.

Iron always hot—no soldering pot needed. Greater speed—better work. The handiest soldering tool.

Regular bit and Radiator bit are shown in illustration.



Remove tip and torch produces clear flame for sweating, brazing, silver and aluminum soldering. Total length, 18 inches.

Complete with two bits—1 Soldering and 1 Radiator bit, $7.50. Extra bits, $2.50.

If your dealer cannot supply you send your order direct.

Ask for Smith's catalog of welding and cutting equipment.

SMITH'S INVENTIONS, Inc., Dept. 1 MINNEAPOLIS, MINN.

Fluxes That Flux

Aluminum Welding

is difficult, in many cases impossible, without the aid of the correct flux.

Deebee Aluminum Powder

for Cast and Plate Aluminum and

Napolitan Flux

for Sheet Aluminum

Have been developed and are manufactured in the Davis-Bournonville laboratories.

These fluxes immediately dissolve the aluminum oxide, permitting the metal to unite, and contain no chemicals that will injure the weld.

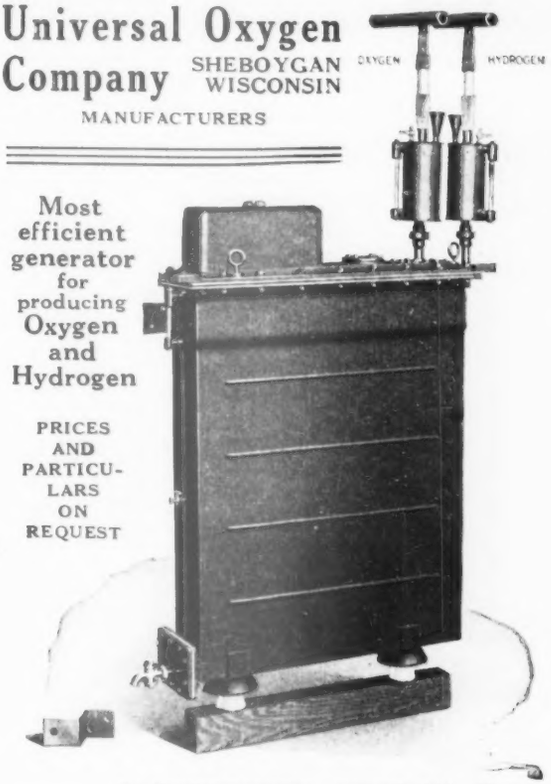
Write for sample

WELDING AND CUTTING
DAVIS
APPARATUS
DAVIS-BOURNONVILLE Co. N.Y.

Davis-Bournonville Company
General Office and Factory
Jersey City, N. J.

Universal Oxygen Company

SHEBOYGAN WISCONSIN
MANUFACTURERS



Most efficient generator for producing Oxygen and Hydrogen

PRICES AND PARTICULARS ON REQUEST

ELECTROLYTIC OXYGEN & HYDROGEN CELL MODEL C

Anti-Borax Welding Fluxes

It Pays to Use Only the Best

Better and stronger welds are more easily and more quickly made with Anti-Borax Welding Fluxes. That's real economy.

For Cast Iron, Brass, Bronze, Malleable Iron, Steel, Cast and Sheet Aluminum.

Anti-Borax Fluxes are scientific preparations which weld at lower heat, leave no scale, cleanse the molten metal, assist fusion and improve the quality of your work.

Anti-Borax Fluxes are the best that money can buy, yet they cost no more—usually less than inferior brands.

Guaranteed to give perfect satisfaction or your money refunded.

WRITE FOR PRICE LIST AND SAMPLE.

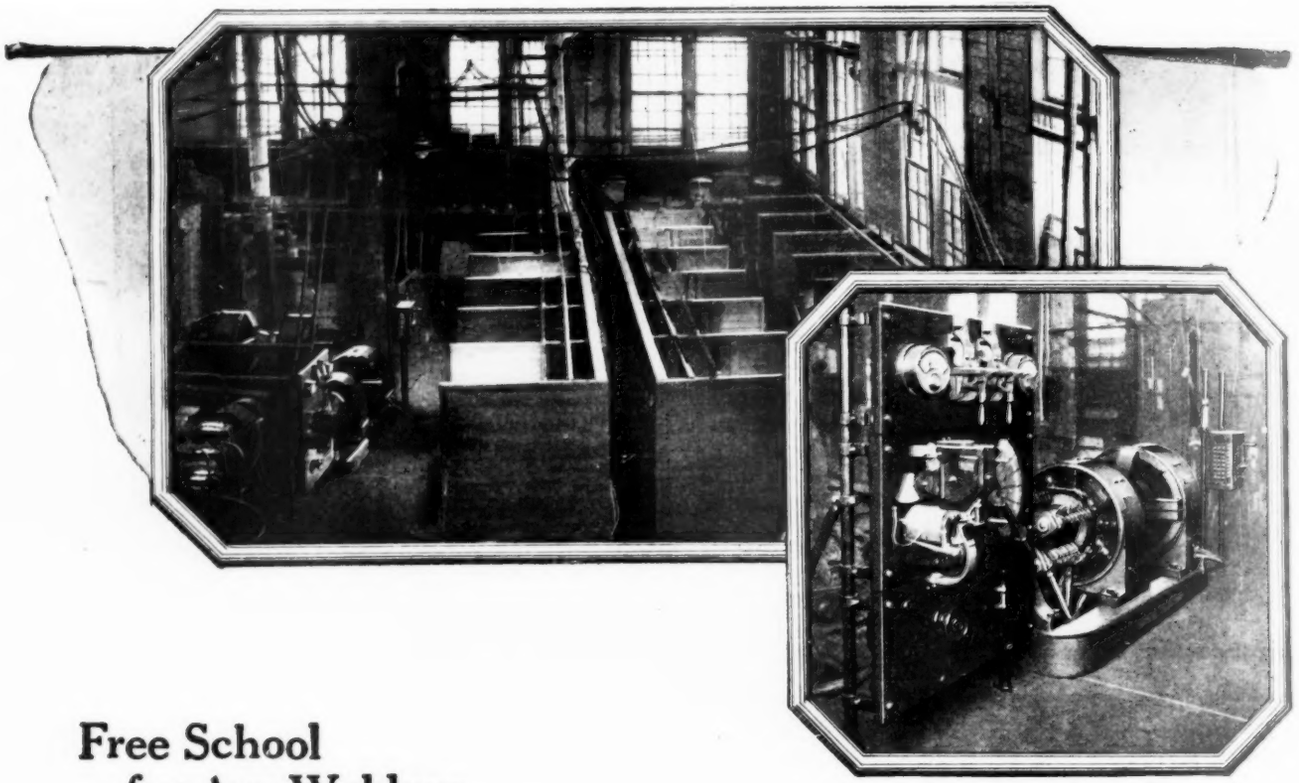
Anti-Borax Compound Company
FT. WAYNE, INDIANA

Clean and Quick Method of Brazing

B. D. M. Co.'s No. 101 Gas Brazing Stand for tool rooms or manufacturing purposes, has two powerful gas blowpipes which are adjustable in any direction. The substantial iron frame carries also an air drum and necessary connections as illustrated. Equally effective for a small piece of soldering, or for a heavy job of brazing requiring both blowpipes and a built-up fire-brick backing. Price $40.00. Catalog "B-7," to be had for the asking, tells all about it.

Buffalo Dental Mfg. Co.
Buffalo, N. Y.

Specialized industrial training eliminates mistakes that are costly in time and material.



Free School for Arc Welders

THE above illustration shows two views taken in the General Electric Company arc welding school at Schenectady, where courses are given in the following work:

Course 1: Repairs to steel castings.

Course 2: Repairs to iron castings.

Course 3: Repairs to steel plates and tanks.

Course 4: Recovery of broken taps and drills from castings.

Course 5: Welding of high-speed steel to low-carbon steel.

Course 6: Welding and cutting by carbon arc.

In from six to eight weeks men who have had no arc welding experience become efficient welders at the General Electric Company school in Schenectady.

Each student's record is kept and will be mailed on request to employer sending him to school.

This training is necessary as, unless operator holds a steady arc of uniform length, "cold welds" will be formed which will readily break open when subjected to a strain.

Dozens of prominent firms and departments of the U. S. Government availed themselves of the opportunity to have their men receive this exceptional training.

Instruction is free of charge to employees of those purchasing G-E arc welding equipment.

43-254

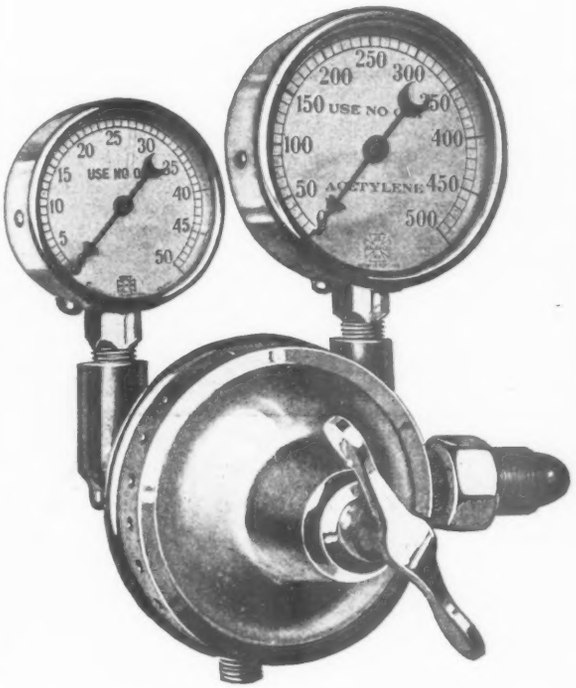
General Electric Company

General Office Schenectady, N.Y.

Master Welders

Use

"Federal" Regulators



For Oxygen, Acetylene and Hydrogen Gases

Here's the Reason Why:

"FEDERAL" Regulators are made of the very best materials by expert mechanics for expert welders who know the value of and appreciate absolutely dependable Regulators.

They are passed by the National Board of Underwriters and their safety features make accidents to operators practically impossible.

FEDERAL BRASS WORKS

31st St. and Kedzie Ave. CHICAGO

Swift's Pure Oxygen

"A Reputation Imposes an Obligation"

Swift Oxygen must pass the most rigid tests —must never vary from its high quality standard.

Swift Oxygen is produced in the largest electrolytic plant in the U. S. A.—in ample quantities to render unequalled service to our customers.

The use of Swift Oxygen in your plant will aid you in raising the standard of the work of your operators.

The Name is Your Guarantee

Swift & Company,

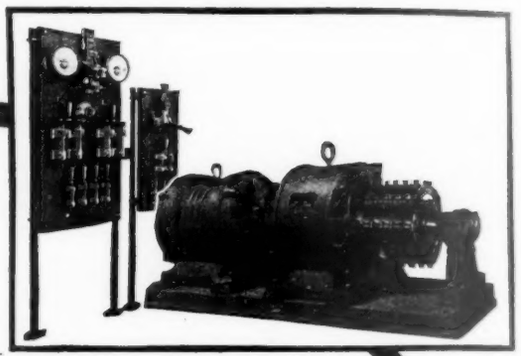
Oxygen Department

Union Stock Yards Chicago, Ill.

Your Welding Equipment Must Supply

"PEP" AND STABILITY

To The Welding Arc



The three prime requisites of Electric Arc Welding Equipments are—

1. Sufficient potential capacity to sustain the arc when lengthened, for you have to overcome irregularities in the material being welded, which causes variations in the resistance of the circuit.
2. In starting the arc your current should not shoot up too high, but should be above the normal welding current in order to give the necessary heat at the start.
3. **Constant heat** at the arc. This requires variable voltage at the arc to maintain constant current, **as the heat of the arc depends on the current flowing.** The reason that variable voltage is required to maintain constant current is due to variation in the resistance of the arc path or circuit due to the following (a) foreign matter such as scale, rust, etc., in the path of the arc, (b) variations in the length of the arc caused by the molten metal traveling from the electrode to the weld, (c) unsteadiness of the operator's hand and (d) unevenness of the surface over which the welding arc is directed.

Westinghouse Electric Arc Welding Equipments meet these requirements.
Built in sizes from 150 ampere to 1,000 ampere capacity.

1. Single operator equipment—Stationary type.
2. Single operator equipment—Portable type.
3. Multiple operator equipment.

Built for all commercial circuits; either alternating or direct current.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

W
WESTINGHOUSE ELECTRIC

Westinghouse

STANDARD SEAMLESS STEEL CYLINDERS

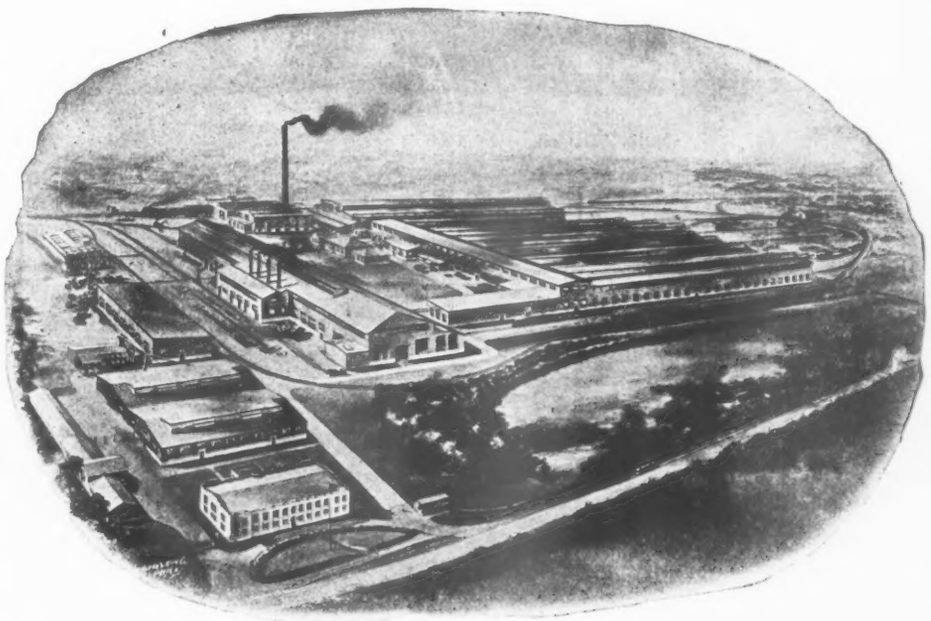
FOR

OXYGEN - HYDROGEN - BLAUGAS

Made to Specifications of Interstate Commerce Commission and Bureau of Explosives.

Right Prices—Prompt Delivery

Superior Service



Plant at Easton, Penna., where Gas Cylinders, Special Track Work, Forgings, Castings, etc., are made.

WM. WHARTON JR. & COMPANY, INC.

(FOUNDED 1859)

GAS CYLINDER GENERAL SALES OFFICES

30 Church Street, New York City

DISTRICT OFFICES:

Boston, Chicago, Cleveland
New York, Philadelphia, Pittsburg
Scranton San Francisco

Sky high in QUALITY

CANADIAN CARBIDE

"More Gas per Pound"

CARBIDE SIZES

Medium	3½" x 2"
Small	2" x ½"
Nut	1¼" x ⅜"
Pea	¼" x ½"
Miners' Special	½" x ½"

Packed in

1000 lb - 100lb
and 25lb Drums
10 lb 5lb. 2lb. 1lb.
Tins

ALABAMA
Bessemer, 2014-2024 Second Ave.
CALIFORNIA
Oakland, see San Francisco.
San Francisco, 427 Rialto Bldg.
ILLINOIS
Belleville, Martha & Clemens Aves.
Benton.
Chicago, 549 McCormick Bldg.
Springfield, 812-814 E. Adams St.
INDIANA
Clinton.
Rochester.
Terre Haute, 15 N. Eighth St.
IOWA
Albia.
Centerville.
Knoxville.
KENTUCKY
Beaver Creek.
LOUISIANA
New Orleans.
MARYLAND
Baltimore, 15 E. Lombard St.
Emitsburg.
Westernport.
MASSACHUSETTS
Boston, 47 Oliver St.
MICHIGAN
Detroit, 343 Bellevue Ave.
Saginaw, Thompson & Franklin Sts.
MINNESOTA
Duluth, Third Ave. E. & Michigan St.
MISSOURI
Joplin, opposite Postoffice.
Lexington.
NEW JERSEY
Paterson, 61-63 Washington St.
NEW YORK
Buffalo, Seneca & Hamburg Sts.
Cortlandt, 41 Elm St.
Malone, 32-34 W. Main St.
Middletown, 28 W. Main St.
New York City, 30 Church St.
Roscoe.
Springville.
Trumansburg, 55 Main St.
Valley Stream.
OHIO
Barton.
Canton, 1372 Dueber Ave.
Cleveland, 3309 Lakeside Ave.
Crescent.
Dillonvale.
Maynard.
Nelsonville.
Salem.
Toledo, 928 George St.
OKLAHOMA
Commerce.
Tulsa.
PENNSYLVANIA
Avonmore.
Barnesboro.
Clymer.
Hastings.
Latrobe.
Nanty Glo.
Pittsburgh, 1222 Farmers Bank Bldg.
Portage.
Pottsville, Center & Market Sts.
Saltsburg.
Scranton.
South Dork.
Wilkesbarre.
Wilpen.
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UTAH
Salt Lake City, 121 W. 2nd South St.
VERMONT
Burlington, Park Ave.
VIRGINIA
Onacock.
Richmond, 1319 E. Main St.
WEST VIRGINIA
Bluefield, 200-206 Railroad Ave.
Charleston, 821 Virginia St.
Clarksburg, 603 Goff Bldg.
Huntington, 1023 Third Ave.
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Morgantown.
Northfork.

CANADA CARBIDE SALES CO.,
INCORPORATED

30 CHURCH ST. NEW YORK — WORKS SHAWINIGAN FALLS, QUEBEC — 549 McCORMICK BLDG. CHICAGO

We Can Save You Money

ON

GAS AND OXYGEN

USE

WELD Trade A Mark CAST FLUXES

"Weld-a-cast" is a scientific combination of chemicals, that causes the metal to melt rapidly, shortening the operation, thus economizing in time, gas and oxygen.

"Weld-a-cast" adheres readily to the hot welding rod which picks up just enough and none is wasted; it does not blow away but melts at once; it eliminates blow holes and leaves the metal soft.

Write For Free Samples

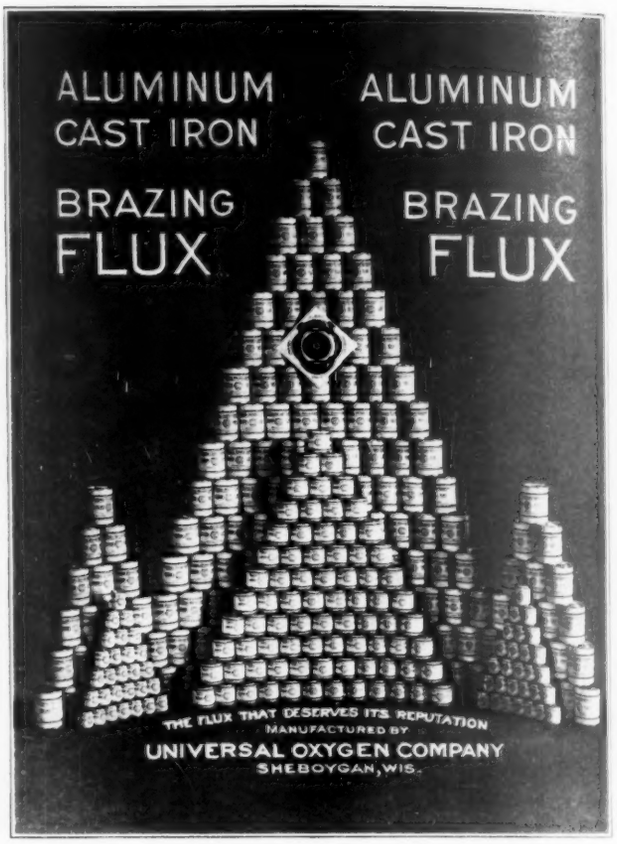
CORTLAND WELDING COMPOUND CO.
CORTLAND, N. Y.

APEX
WALLOON
WELDING
WIRE

The Highest Quality Welding Wire Made

SWEDISH MATERIAL
for
OXY ACETYLENE
and
ARC WELDING
Samples on Request

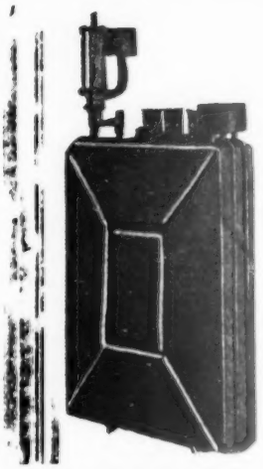
APEX STEEL CORPORATION
50 CHURCH STREET, N.Y.

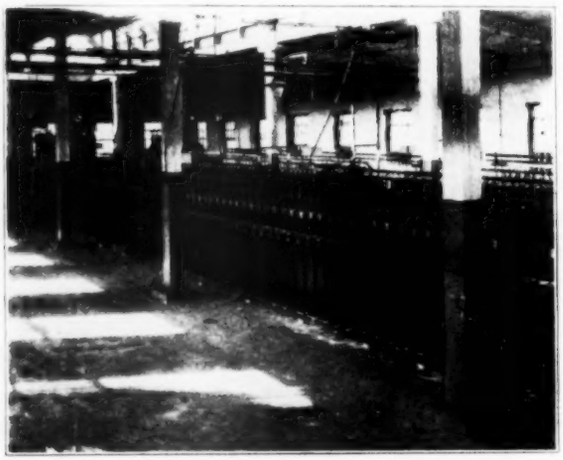


REDUCE THE COST OF WELDING

Electrolabs Apparatus Does it

A **constant** and **sure** supply of Oxygen is an insurance you need in your welding shop. Electrolabs Installations are of all sizes and capacity—large and small. You get pure Oxygen and also Hydrogen for cutting. Both gases cost less than half the cost of Oxygen in Cylinders. Write for details.





A 1000-Cell "Electrolabs" Installation for the Paschall Oxygen Co., Philadelphia, Pa.

THE ELECTROLABS COMPANY
15 Williams St., New York, N. Y.

General Office and Works:
2635 Penn Avenue,
Pittsburgh, Pa.

Under the Technical Supervision of the Electrolytic Oxy-Hydrogen Laboratories, Inc.

Electrolabs
ELECTROLYTIC GAS SPECIALISTS

Morris Bldg.,
Philadelphia, Pa.

Merchants' Exch. Bldg.
San Francisco, Calif.

Steel extension section Thermit Welded to the end of a 25-in. diameter crankshaft, in one of the biggest steel plants of the world.

IN ONE SENSE

THERMIT WELDING is like a Fairy Story

Because when broken steel sections are Thermit Welded they "live happily forever afterward."

But *no* fairy stories are the thousands of prompt and reliable Thermit repairs of broken crankshafts, blooming mill shafts, roll and pinion necks, pinion teeth shears, housings, drop forge sections, locomotive frames and many other varieties of heavy steel sections *which have stood up for years in service.*

Thermit Welding can in practically no time save you the cost and delay of purchasing and installing new equipment by making your broken equipment absolutely as good and *as permanently good* as new.

We are prepared to give you prompt service in case of a breakdown which is tying up your production. If you are in a hurry, wire us or telephone our nearest office.

Pamphlet 1779 explains all about Thermit Welding. Send for it.

METAL & THERMIT CORPORATION

120 Broadway, New York

329-333 Folsom Street, San Francisco — **15 Emily Street, Toronto, Canada**
7300 So. Chicago Avenue, Chicago, Ill. — **1427-1429 Western Ave., Pittsburgh, Pa.**

Factories located at Chrome, N. J., Wyandotte, Mich., East Chicago, Ind., Jersey City, N. J.

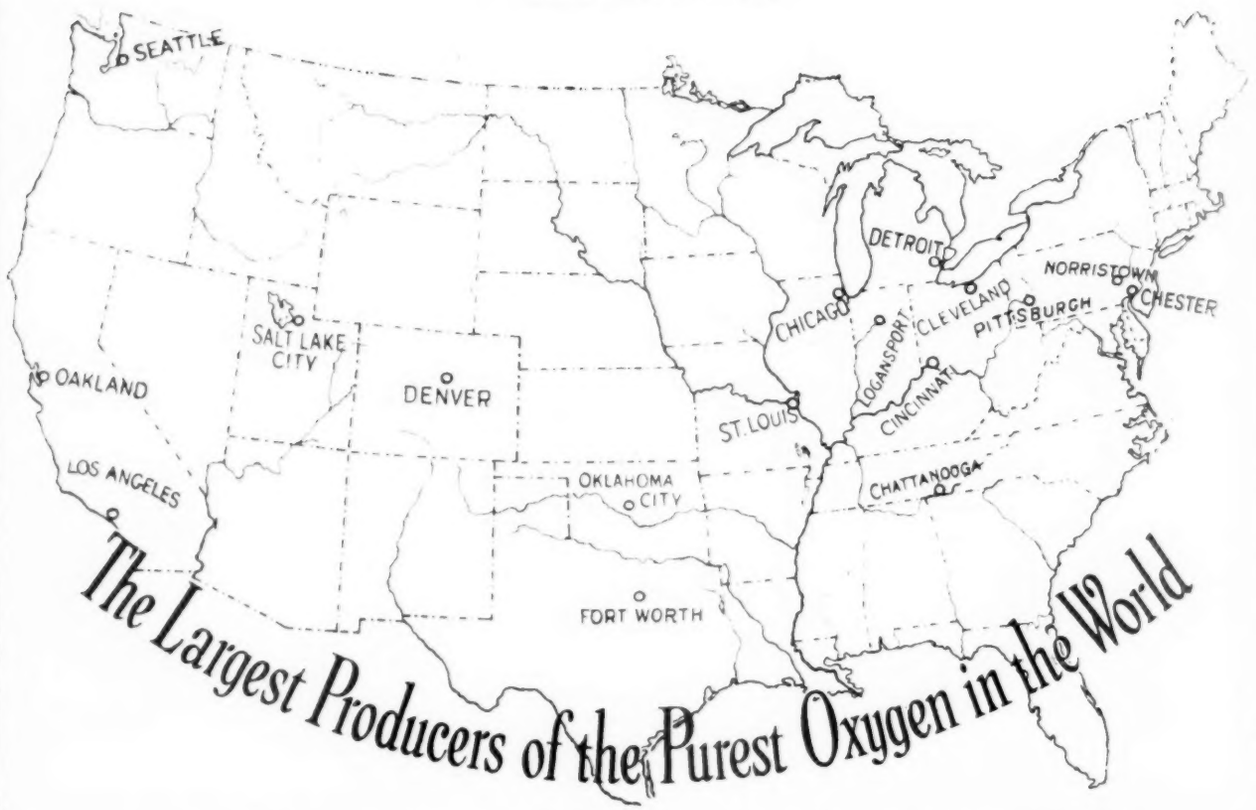
BURDETT OXYGEN COMPANY

AND ASSOCIATED COMPANIES

ELECTROLYTIC OXYGEN and HYDROGEN - 99 1/2 % Pure

Service from the following BURDETT PLANTS

Seattle, Wash.
Los Angeles, Cal.
Oakland, California
Salt Lake City, Utah
Denver, Colorado
Oklahoma City, Oklahoma
Fort Worth, Texas
St. Louis, Mo.
Detroit, Michigan
Logansport, Ind.
Chattanooga, Tenn.
Cincinnati, Ohio
Pittsburgh, Pa.
Chester, Pa.
Norristown, Pa.
Cleveland, Ohio
Chicago, Illinois



The Largest Producers of the Purest Oxygen in the World

During the hurry and excitement of war times, none of us investigated the merits of competing machines as closely as we should. We were influenced largely by promises of prompt delivery.

In a short while we will again be on a peace basis. Competition will then compel us to buy THE MOST EFFICIENT. The wise man will employ the present transitional period in investigation. Examine a Willis Welder. Try one. Willis Welders are Good Welders.

Henderson Willis W. & C. Co.,
2305-15 North 11th Street,
St. Louis, Mo.

ATTENTION! WELDERS!

Do you want to know how to fix scored cylinders quickly and easily without the necessity of re-boring and so the old pistons can be used? If so, send us self addressed stamped envelope together with the name and address of a firm using oxy-acetylene welding or cutting and the make of apparatus in use and we will send full instructions without cost.

How Much Oxygen? Where? When?

YOUR answer—quite regardless of quantity, place, and time—means to us another order to be filled easily, promptly, gladly.....To you, it means all the oxygen you want, where you want it, when you want it. For Linde Oxygen Service is ample, everywhere, all the time.

There are 65 Linde Distributing Stations, the service areas of which cover the United States. Wherever you are located, you are within easy distance of one or more of these stations.

Whether for 1 Cylinder or 1000 We'll
Fill Your Orders Immediately

319

The Linde Air Products Company

Largest Producer of Oxygen in the World

30 East 42d Street
New York

KOHL BUILDING
San Francisco

STANDARD BOILER WELDING

OXY-ACETYLENE *and* ELECTRIC WELDING *on the* KANSAS CITY SOUTHERN RAILROAD*

IN order that greater uniformity and better results may be obtained in preparing work and making welds, the following methods and practices have been selected after considerable study, experiments, and personal observation of the welding work in many shops throughout the country and are considered the best and most practical methods in use today and have been adopted as the standard practices, and must be followed as closely as local conditions will permit.

Each foreman and welder who follows these instructions will find his work more satisfactory and easily understood. As time advances and our experience widens with the knowledge of welding operations, suggestions for improvements in better methods will be appreciated and carefully considered, and if a better way is found it will be adopted in place of any practice in force now; however, no changes will be made until they are submitted to the welding supervisor, and instructions issued therefrom authorizing the change.

2.

In making preparations for making a successful weld there are five very essential and important things to consider, namely:

1. Condition of surfaces.
2. Bevel of sheets.
3. Position of sheets.
4. Provision for expansion and contraction.
5. Proper filler metal.

The importance of these points cannot be overestimated, and the failure to comply with the instructions covering any one of them will result in a questionable or bad weld. The success of a weld depends on the rigid observation of these items.

3.

When sheets and patches are to be applied, extreme care should be taken that all of defective parts are cut out, and also cut where there will be a good foundation for the weld.

4.

All sheets and patches should be cut out on a straight or uniform line, avoiding stay bolts wherever possible.

5.

Never cut out sheets or patches through old weld where same have been welded previously; for side sheets or three-quarter door sheets, extend new sheets at least one stay bolt row higher; for crown sheet, one stay bolt row lower; for patches, extend weld at least one row of staybolts larger; for flue sheet, extend weld to one row of staybolts lower.

6.

Do not cut out sheets or patches and bevel the sheets at the same time; if sheets are beveled with torch before chipping, it can be done after parts are cut out; this is necessary to insure a uniform line, as well as to insure a more perfect fit of new parts.

7.

Clean surfaces are absolutely necessary for making good welds. If scale, rust or grease is permitted to remain on the surface to be welded, a slag is formed that will make a streaked and seamy weld. All surfaces must be kept free from foreign substances; all welding surfaces must be kept clean and bright.

8.

Experience has proven that the most satisfactory angle of the beveled faces preparatory to making the weld is an angle of 45 degrees with the surface of the sheets. The total angle between bevel faces must be 90 degrees in all cases, even if one sheet has to be beveled more than the other. Improperly beveled sheets prevent the welding flame from properly penetrating the bottom of the weld and prevents the weld from uniformly uniting with the edge of the sheet.

9.

Where horizontal welds are to be made with electric welder it has been found a very good policy to bevel the edge to about a 60 degree angle and the bottom edge about 30 degrees. See page No. 18.

10.

All sheets and patches are to be fit carefully with an opening of 1/8", "no more, no less," between bevel edges. Less than 1/8" opening between the sheets will not permit the welding flame to penetrate the weld properly, and a greater opening requires too much filler metal to be used, and not only increases the cost of the weld, but also makes it impossible to keep the surface of the weld opposite the torch smooth. This rough surface permits lamination and seams of the "water side" of the sheet; this weakens the weld and permits early corrosion of the metal, which tends to part the sheets.

11.

All other precautions may be carefully made, and yet a faulty weld will be made if due care is not taken to allow for expansion and contraction of the sheets. Where it is not possible to obtain the necessary expansion and contraction through curves of the adjacent sheets, it is then necessary to provide some method to take care of expansion and contraction; in this case, all sheets and patches will be corrugated as per sketch. Page 2. A strain on a weld, especially where the new sheet is welded to an old sheet, which is generally the case, is particularly harmful, as the old sheet will not stretch as much or as uniformly as the new one.

12.

For fitting corrugated sheets or patches they should be bolted securely into place and when they extend to the mudring good drift pins should be inserted in mudring holes inside side and outside so that the sheet cannot move upward due to the contraction, as the contraction should be taken from the corrugation. Bolt sheets at welding and as usual, that is to say, insert a 5/7" bolt through every fifth staybolt hole and screw in a staybolt from the outside between each of the 5/8" bolts; this will hold the sheets in line; then insert small wedges between welding edge, spaced about 14 inches apart to keep sheet from pinching together during the welding. See Page 18.

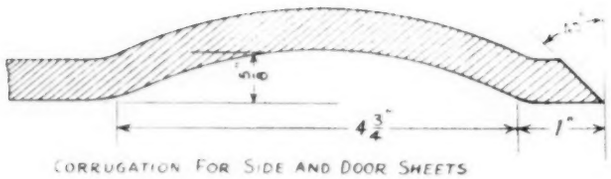
13.

Where side sheets are to be welded at the ends, it is necessary to remove the adjacent row of staybolts to the edge of flange of door or flue sheet before welding is commenced. It is also advisable to remove all staybolts adjacent to welds after welding is completed.

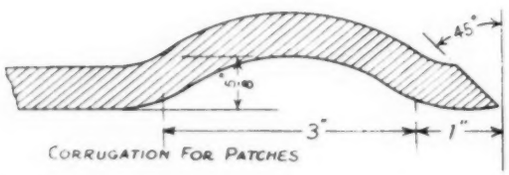
14.

When welding corrugated sheets or patches with the oxy-acetylene method, the following instructions are to be carried out: With every 12-inch of welding completed the operator

*Courtesy of Mr. G. M. Calmbach, Supervisor of Welding.

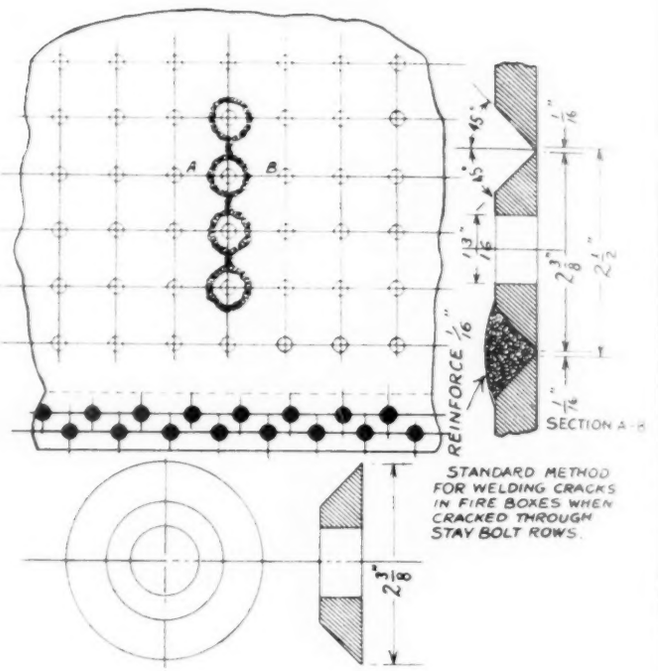


CORRUGATION FOR SIDE AND DOOR SHEETS

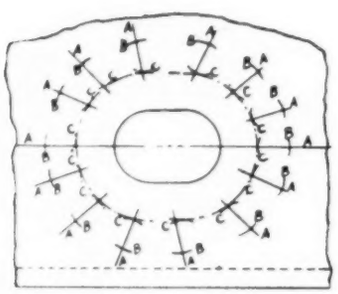


CORRUGATION FOR PATCHES

ACTUAL SIZE OF CORRUGATIONS FOR SHEETS AND PATCHES

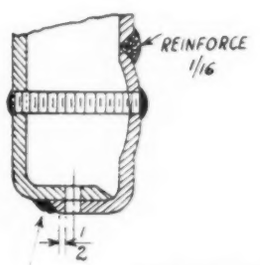


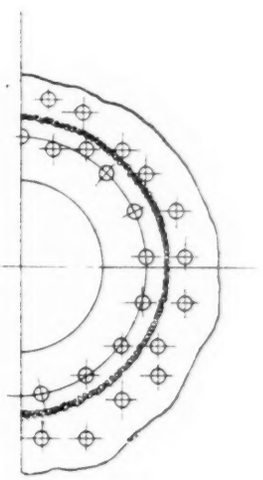
STANDARD METHOD FOR WELDING CRACKS IN FIRE BOXES WHEN CRACKED THROUGH STAY BOLT ROWS.



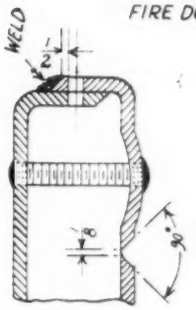
Method of laying out patches for Welding

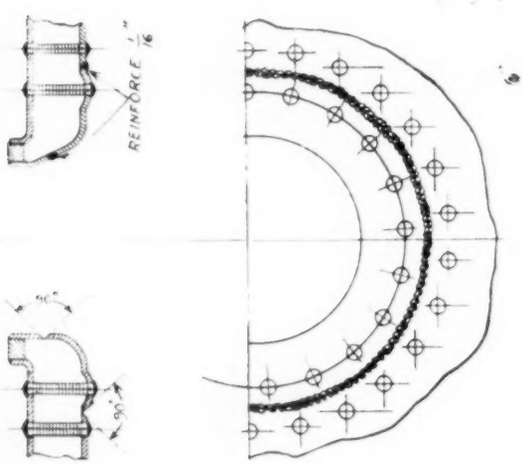
After sheet is cut out and beveled, scribe a number of lines "A" as shown with dividers set about 6" scribe arcs "B" from edge of bevel as shown. When patch is ready to lay off bolt it into place. Then extend lines "A" a sufficient distance across patch with dividers set to some distance used before, with intersection A-B as center, scribe arcs on line "A" at "C" on patch. Then cut out patch along intersection of arcs "C" on lines "A"



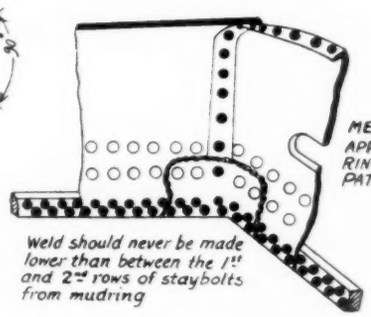


METHOD OF WELDING FIRE DOOR PATCHES



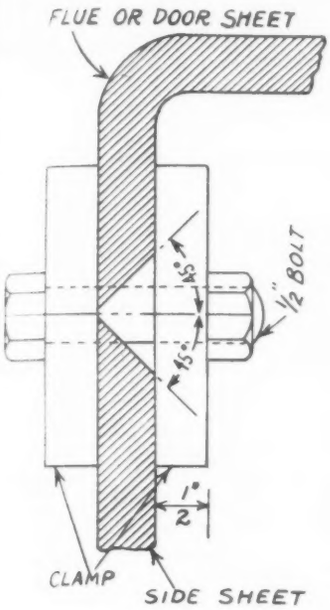


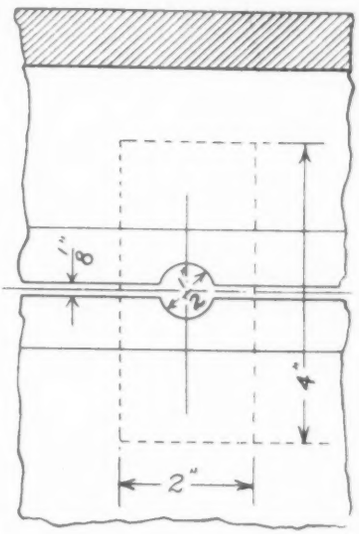
BUTT WELDED FIRE DOOR PATCH

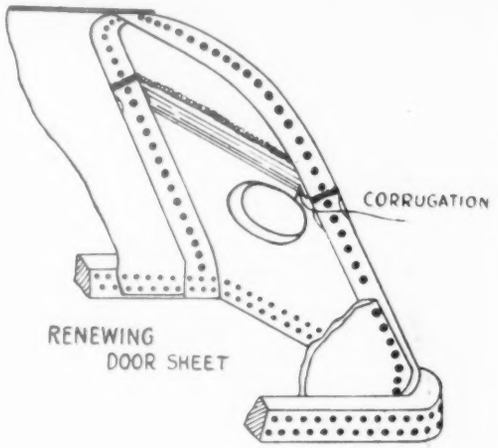


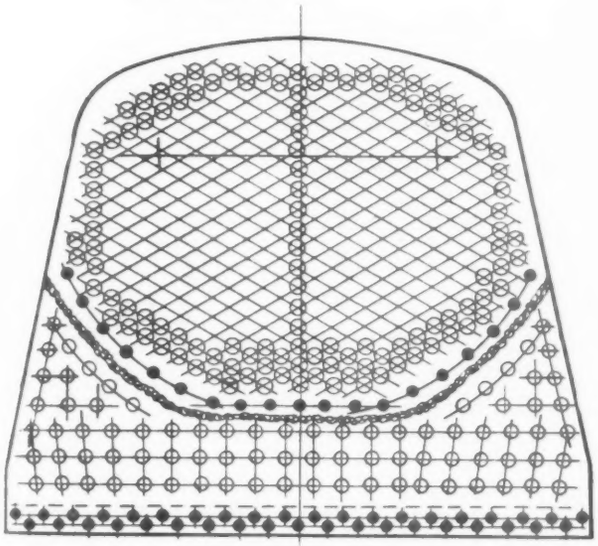
METHOD OF APPLYING MUD RING CORNER PATCHES

Weld should never be made lower than between the 1st and 2nd rows of staybolts from mudring

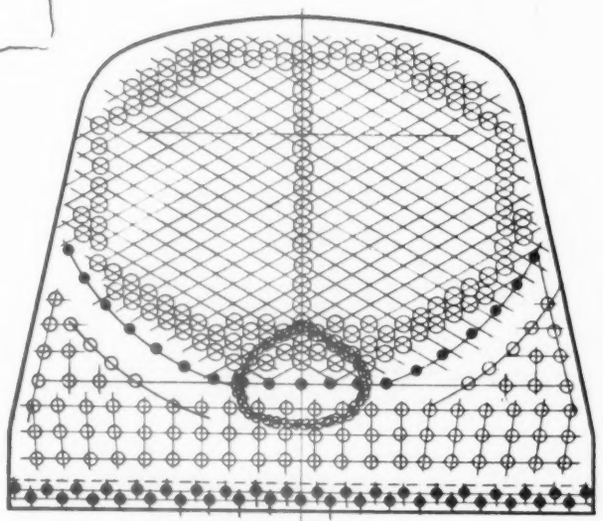




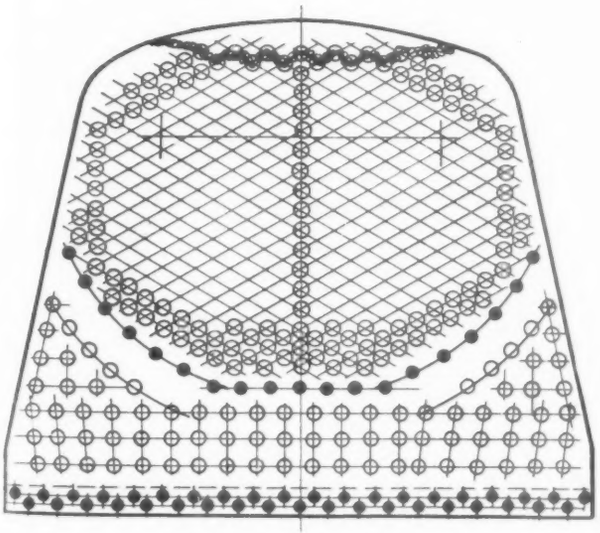




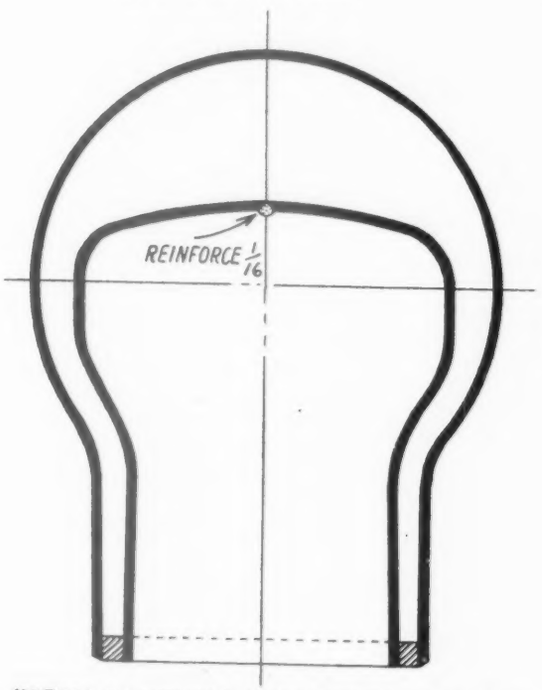
FLUE SHEET WELD



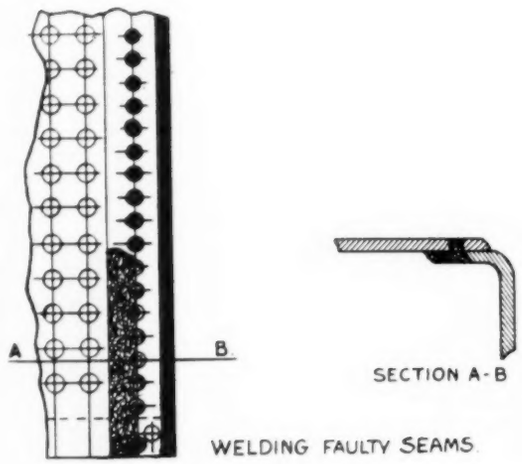
FLUE SHEET WELD



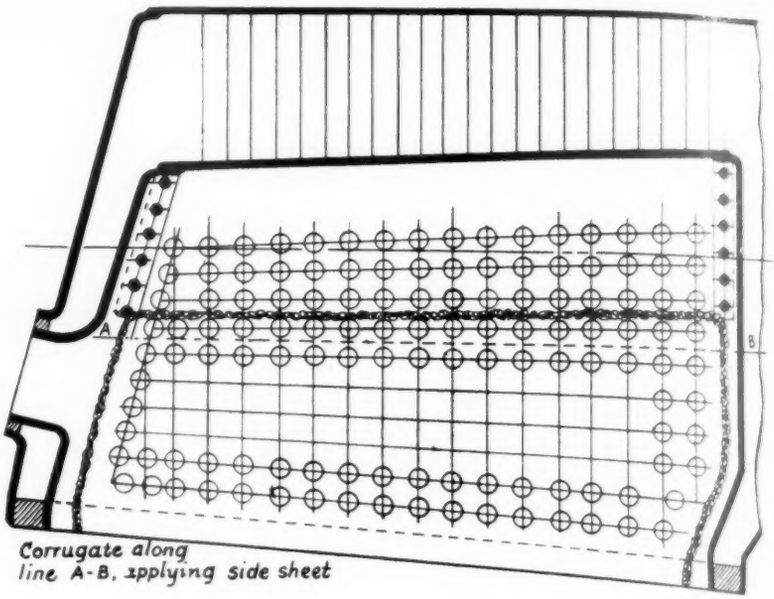
FLUE SHEET WELD



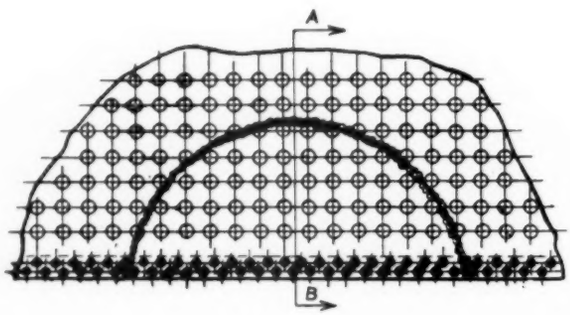
METHOD OF APPLYING OGEE FIRE BOXES WITHOUT REMOVING MUD RING



WELDING FAULTY SEAMS

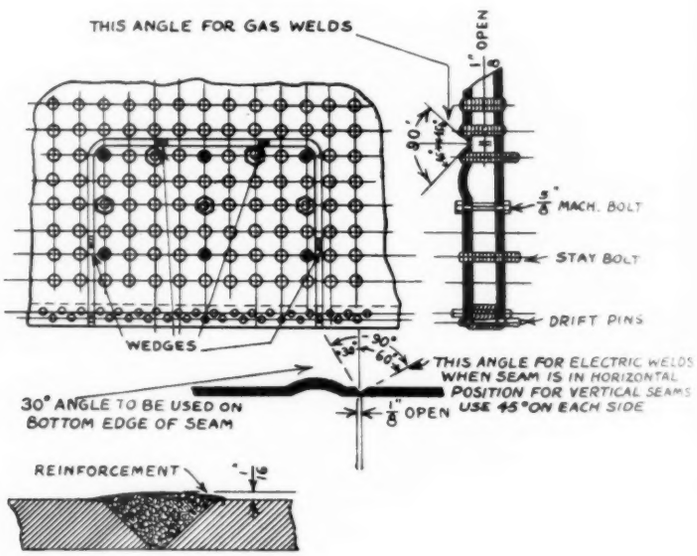


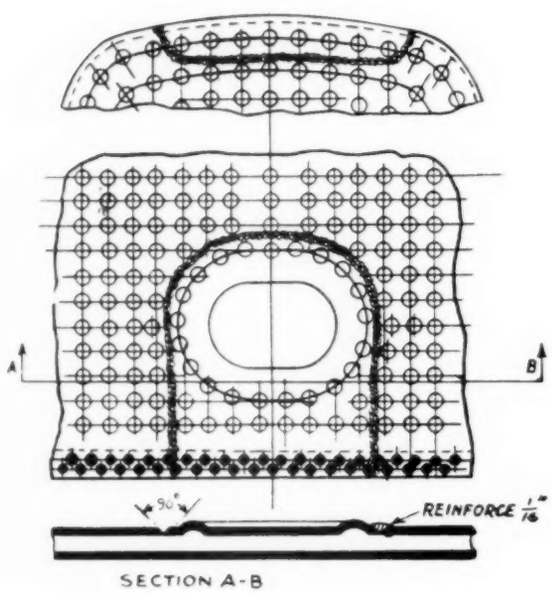
Corrugate along line A-B, applying side sheet



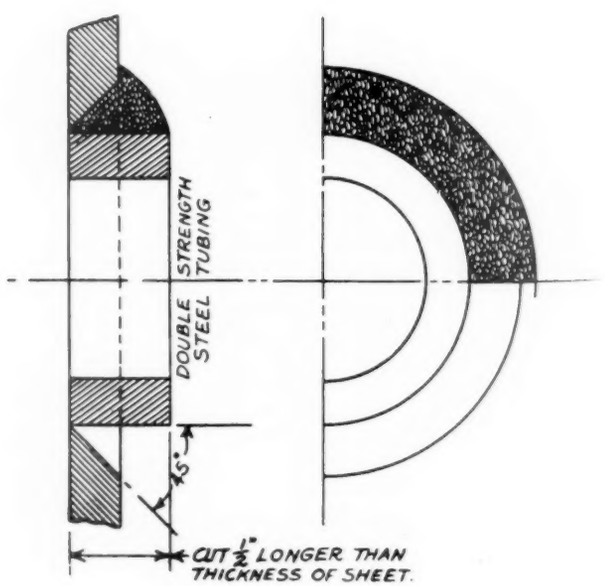
PATCHING CASING SHEETS

SECTION A-B SHOWING OFFSET





SECTION A-B



will clean and heat a line 1-inch wide through center of corrugation to a red heat and continue this until weld is finished.

15.

No firebox welds should be reinforced more than ¼", as too great a reinforcement is injurious to a weld due to overheating when in service.

16.

For fire door patches, when collars are to be welded they should be cut out at a point where at least one row of stay bolts are in a patch and as near round as possible. When patch is cut out at a point 6 inches or more from fire door edge they should be corrugated all around as per sketch two for corrugating, it will not be necessary to corrugate if patch is cut out less than 6 inches from door hole. When fire door patches are extended to mudring and 6 inches or more from fire door edge the patch will be corrugated all around but where patches do not extend to 6 inches from fire door edge it will only be necessary to corrugate both sides of patch from a point about center of fire door down to mudring. See pages 5 and 16 to 18.

17.

Welding of cracks in side sheets, door sheets, fire doors, crown sheets, bottom and top of flue sheets should never be attempted as such attempts have been a source of much trouble and engine failures. However, it may be considered necessary at time to weld certain cracks, in this case is should only be resorted to in EXTREME EMERGENCY CASES, and then such work should be classed as strictly temporary and should be corrected at the very first opportunity. It is, of course, known that such work as welding cracks in barrel of boiler, welding over stay bolts and welding stay bolts is strictly against the law and will not be allowed at any time. Page 4 for method of welding through row of stay bolts.

18.

When it becomes necessary to weld seams that have given away such as those between door or flue sheet and side sheet, the rivets should be removed and outside of fire side, lap should be cut off through center of rivet holes, "do not cut side sheet" it should be then cleaned thoroughly before welding is commenced. Weld holes solid and lap weld sheets. See page 19.

19.

Proper Method of Fitting, Preparing and Welding Fire Box.

Fire box should be set up on floor with all stay bolt and mudring rivets holes applied, except mudring corner holes holes which should be drilled after sheet is laid up and welded.

Welding edge should be chipped to a 45 degree angle and chipped on a straight line so as to insure a uniform opening between welding edges of ⅛ inch.

Lower portion of sheet from a point about 14 inches from bottom of flue and door sheet should not be chipped until box is in place and mudring corners laid up in place.

Bolt sheet securely in place being sure that there is uniform opening of ⅛ inch all around welding edge.

Use a ½ inch drill and drill holes spaced about 14 inches apart, and use ½ inch machine bolts with clamps made of boiler plate ½x2x4 inches using one of these pieces on both sides of sheet, being sure that all bolts are drawn tight. See page 10-A.

Start welding at top and work to each side until bend of crown sheet is reached removing clamps as you get to them, then drop down to the next clamp and weld up to end of previous weld, continue this operation until completed removing clamps necessary.

20.

For Ogee Fire Box Type.

Use same method as above. After fire box is fit up properly, cut wrapper sheet through center of crown sheet for welding, this seam to be welded before flue and door sheet are put into place.

OXY-ACETYLENE WELDING SCHOOLS, MOTOR TRANSPORT CORPS, U. S. ARMY†

By C. K. Bryce*

Under the expanded program of the Army one of the very noticeable shortages in the personnel of the Motor Transport Corps was that of oxy-acetylene welders. Welders were required in the Maintenance Divisions of this Corps. In this Division were two units that included welders—the Base Repair Shop units and the Machine Shop Truck units.

The Base Repair Shops were large shops of about 250,000 square feet of floor space, in which every operation in the rebuilding or repair of a motor vehicle could be carried on. Naturally, an important department was the Welding shop. This was completely equipped with an acetylene generator, blowpipes, regulators and auxiliary devices, in accordance with latest practice. These shops were permanently erected and located in proportion to the motor vehicle requirements of the territory or troops to which they were attached.

The Machine Shop Truck units were essentially small machine shops on wheels. The principal truck had mounted on it a lathe, drill press, grinder and other tools for automobile repair and upkeep. In the equipment was included a complete oxy-acetylene welding and cutting outfit. Attached to the underside of the truck body were two oxygen cylinders and one acetylene cylinder. These mobile shops were used for minor or emergency repairs, which it was not practicable to put through the Base Repair Shops. Each Army had a certain number of these units assigned to it.

On surveying the welding talent necessary to fill these units less than 100 welders were available. From the tables of organization it was estimated that between 1,500 and 2,000 would be required in six to eight months' time. The usual channels of draft, induction, enlistment and transfer from other Corps being discontinued, it was apparent a new source must be created.

In May, 1918, after considerable activity on the part of Col. J. W. Furlough, Deputy Chief, Motor Transport Corps, the organization of a welding school was started. This school was divided into three sections, to be located at each of the three Base Repair Shops then in proces sof erection in this country—namely, Camp Holabird, Md.; Camp Jessup, Ga., and Camp Normoyle, Texas.

Each school was laid out to accommodate a class of 100 welders, with provisions to increase this to 150. The buildings consisted of a school building proper, and an oxygen and acetylene house. The main building was divided into a welding room, lecture room, offices, stockroom, and repair shop.

The welding room consisted of rows of stations, piped with oxygen and acetylene from a central source. Each station occuped 7½ x 6½ feet of floor space, and consisted of a cast iron welding table, blowpipe, oxygen and acetylene regulators, hose, etc. The oxygen and acetylene were piped in headers between the rows of tables. Oxygen was distributed from a 30-cylinder manifold; acetylene was generated in a non-automatic generator at low pressure, and delivered to a 1,000-cu. ft. gas holder; from there it was compressed in a single stage compressor to about 10 lbs. pressure. After passing through suitable regulating and relieving devices the gas entered the station headers.

The course of training was from six to eight weeks' duration. The actual welding time averaged about 60 hours. In addition to this, there were about 30 hours of lectures and talks. A course of 60 standard problems, selected to cover the motor truck welding field, was selected. These

†Paper read before International Acetylene Association, New York, July 15-17, 1919.

*Formerly Major, M. T. C., U. S. A.

problems covered steel, cast iron, malleable iron, aluminum, brass, bronze, copper, brazing and lead burning.

The students were compelled to perform each problem satisfactorily before progressing to the next. Every morning he was given a short talk on technical factors involved; On Saturday morning he was questioned on the week's work.

The training progressed by weekly grading, which allowed a flexible and continuous scheme of instruction. At the beginning of each week a green squad of from ten to fourteen men entered the school. At the end of each week a finished squad was graduated. The new men would be taken in charge by the instructor supervising the first week's training. At the end of this time, provided their work was satisfactory, they would be advanced to the next grade under the instructor in charge of the second week's training.

This arrangement proved satisfactory, since it was possible for a student to advance more rapidly than his squad should his skill warrant it, or in case he were backward, to progress at a slower rate. Also, another important feature which had to be considered was that of instructors. In this scheme the instructors were specialized on a limited section of the training only. They could, therefore, be developed faster and more efficiently than if they were given a more or less general training for the entire course.

After a student had completed a problem, it was inspected by the instructor, and where required, the weld broken and the fracture examined. The student was graded accordingly. These grades were recorded and averaged with the grades given in the lecture room. If, at the end of four weeks, a student who had entered as a private was above a certain average, he was recommended for promotion to Private, First Class. During the last week of the training the student was placed on practical jobs without any assistance from the instructors. This was in order that he attain confidence in his own ability to overcome difficulties that might confront him.

When he had satisfactorily completed his practical work he was given a written quizz, to refresh his mind on essential points. He was then awarded a certificate and relieved from the welding school detail, and held ready for assignment to duty. In active service the Motor Transport Corps graded the welders from Sergeants, Senior grade, to Corporals, the average grade being Sergeant. The Sergeants, Senior Grade, were foreman welders connected with the Welding Department of the Base Repair Shops. The Corporals were helpers.

At the time of the signing of the Armistice only one of the three schools was in full operation. Due to delays in building appropriations the other school buildings were just being started. These were finally abandoned.

The Camp Holabird school, which was in operation, was housed in a three-story distillery building already erected, and because of this had several months' start on the others.

It was shown, in this method of training, that the difficulty connected with the production of welders was more or less imaginary. Of the men received—and these were not selected because of any particular qualifications—there were only about 8 per cent rejections. In practically all cases this was due to disinclination rather than inability to absorb the training.

In proportioning the course, 3½ weeks were spent on steel, 2 weeks on cast iron, 1 week on aluminum and the remainder on miscellaneous metals. Steel being the first metal tackled by the student, more time was spent on this, in order that he thoroughly master the fundamentals. Aluminum welding was grasped quite readily, as was also cast iron.

The welding school has become a permanent institution in the Motor Transport Corps. Originally conceived for emergency training it now fits in nicely with the educational plans that have been adopted for peace time service. Recruits are given the opportunity of learning one or more of the trades connected with motor truck operation and maintenance. Oxy-acetylene welding has met with its share of popularity and it is believed that the school will be filled to its capacity at all times.

THE TECHNICAL ENGINEER'S JUDGMENT OF THE OXY-ACETYLENE PROCESS

By Alfred S. Kinsey*
Member A. S. M. E.

The commercial success of a mechanical process or device often may depend on two factors: Its utility as determined by the manufacturer and its efficiency as judged by the technical engineer. No one knows better than does the owner of the metal working plant or the superintendent of the repair shop how great the need has been for quicker and more thorough methods of manufacture and ways of making repairs, and few have looked forward with greater interest than has the mechanical engineer to the coming of safer and more efficient mechanical devices and processes. One has been the stimulus of the inventor, the other the surety of the manufacturing world.

The technical engineer's position in this progressive age requires no evaluation, his critical scientific attitude no defense. His is the problem of casting beyond the superficiality to the durability of things, from the flimsy to the substantial. Unquestionably this has produced in the engineer a conservatism, a habit of close inquiry which make for safety and success. The manufacturing world, therefore, still seeks the judgment of such a mind, and the technical engineer's endorsement is often the final. It may be of interest, therefore, to learn what he thinks of such a modern process as that of oxy-acetylene welding.

Up to the advent of autogenous welding the engineer had only his experience with the forge weld upon which to base his calculations and judgment. In a way this proved somewhat unfortunate for the new method of welding, as the forge weld had nearly lost its value as a dependable means of joining metals. Imagine two pieces of steel being brought to a soft plastic condition in a forge fire charged with sulphur from the fuel, an excess of oxygen from the indifferently operated bellows or fan blower, the cinders and refuse of the fuel, and one can readily realize the cause of weak forgé welds. Such welds never were reckoned to have a tensile efficiency of more than about 50 per cent, and many observations of welds which had failed showed crystallization and even entrapped cinders. Navy yards and many other large shops had practically abandoned the forge weld, preferring the expensive substitute of machining a joint out of the solid when it was possible to do so. Serious failures of forge welds were too common. The author recalls many of these, and particularly one regarding which he assisted in a suit for damages where a hoisting hook on a city pier had parted at the weld, causing the death of the father of a family of small children. There was a demand for a safer and more efficient way to weld steel and wrought iron.

Then, too, in those earlier days the only metals which could be welded were wrought iron and steel. There was no way to weld cast iron and the non-ferrous metals like copper, brass, aluminum. The mechanical engineer, of all men, realized these limitations. He knew that the time was ripe for a new method of welding metals.

Then came autogenous welding and cutting by the oxy-

*Paper read before International Acetylene Association, Nov. 1919.

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GOOD welding shops are an asset to any community. They should be encouraged and helped. The Editor of The Welding Engineer will be glad to have information and photographs relating to any successful job welding shop.

This page is intended to be a directory of America's best shops. The cost of advertising is low. Write for details.

F. B. Macauley

hydrogen process, soon to be superseded by oxy-acetylene, thanks to the electric furnace's efficient method of producing calcium carbide and making acetylene a commercial possibility. From that time,—practically only about fifteen years ago,—metal workers, manufacturers, engineers, nearly the whole industrial world have eagerly watched the progress of the oxy-acetylene process.

The mechanical engineer recognized at once that there were certain fundamental principles involved in oxy-acetylene welding which were new to shop practice, such as:

First: That autogenous welding was accomplished by fusion instead of plasticity. The old method required that the metal be heated merely to a soft pasty condition and then hammered or pressed together, while the new way was to melt the metal and flow the two ends into one mass. By the former method there could not be a thorough mingling of the grains of the metal because it was only plastic, and besides there was every opportunity for such a weld to receive gas and fuel impurities from the forge fire. By the new process there could be nearly perfect rearrangement of the grains due to the liquid condition of the metal. The mechanical engineer recognized at once, however, that while the fusion of castings for welding would be consistent with the method of their formation, that is, that both the original metal and the weld itself would be in the cast condition, this would not be true in the case of the welding of rolled or forged wrought iron or steel. There the two pieces of rolled or forge metal would be joined by a cast weld, the former being fine grained and strong, the latter of coarse grains and reduced tensile strength. This was not a new situation to the engineer. The benefits derived from hammer-refining the grains of steel are well known. An ordinary machinist hammer, therefore, proved to be the cure of this trouble, and it may be of interest to relate that in some experiments performed during the past year by the author for the Air Reduction Company of New York at the shops of the Baltimore and Ohio Railroad at Martinsburg, West Virginia, and at Brunswick, Md., some worn railroad frogs which

Fig. 1. This is an illustration of an absorbtion gasoline plant which takes gasoline out of natural gas. The four large pipes are known as horizontal absorbers, four joints of pipe being welded together; 16 and 24-inch pipe. The same are bull-plugged at both ends. Note the welds along the side; all joints being welded. Fig. 2. Showing verticle absorbers. Both ends welded connected with 6-inch pipe, showing two 90 degree welds. Fig. 3. Showing view of welded coils. Brackets which holds pipe in rack have all been welded. Fig. 4. Making a weld on 8-inch pipe. Fig. 5. Showing a welded gas pipe-line. Same is being laid underneath the river. Fig. 6. Showing a number of welds on large absorbers. Fig. 7. Showing different kinds of swedged joints and nipples. Note the 8-inch pipe is swedged to 6 and the 6 to 4-inch. Large 10-inch pipe has been bull-plugged at both ends. Fig. 8. Showing a number of special fittings where pipe are bull-plugged, also nipples welded in same.

Courtesy of Mr. E. N. Stevens.

were built up by the oxy-acetylene process, and allowed to cool directly from the liquid to the solid condition lasted only a few weeks in service, but when a progressive method of building up and hammering was resorted to, some of the welds lasted over nine months in continuous severe service.

Second: That as fusion was the chief requisite of a good weld, the new process might be used to join other metals than wrought iron and steel. This opened up wonderful possibilities, new indeed to welders, for cast iron and the non-ferrous metals had not yet been welded. Would it be possible for the new welders to learn the marked differences of characteristics of steel, cast iron, copper, brass, aluminum? We have but to call to mind the work being done in the welding of iron castings alone to get an answer and to form an idea of the possibilities and value of the oxy-acetylene process for the welding of cast iron. The author recently had to do with the oxy-actylene welding of three broken cast iron cylinders of freight locomotives, which cost $515 to weld and put in good working order, but would have cost $3,600 to replace by new cylinders if oxy-acetylene welding had not been available, leaving out of consideration the long delay in getting the locomotives back in service by the old method of making repairs as compared with a few days' lay up for welding.

Third: That the gases used in an oxy-acetylene torch operated by inexperienced welders might easily be made to lower the value of the weld. Many of the first oxy-acetylene welds were badly crystallized. The engineer knew this and waited for developments. The first designs of torches were much to blame for this condition, but the inexperience of the welder was more so. It is not unusual now to find oxy-acetylene welds so homogeneous as to make it practically impossible to see any difference between the original material and its weld.

Fourth: That unusual problems of expansion and contraction must be reckoned with in the job welded by oxy-acetylene. No one would attempt to dispute this. The cautiousness of the engineer in this regard may well be understood. It has required an experimental experience to master these difficulties, but they do not stand in our way now.

Fifth: That the heating of the oxy-acetylene weld was accomplished by the powerful quick-acting flame instead of a slow forge fire. It was readily seen that a trained eye would be required to bring about good results from the working of the metal in the molten condition. What would happen if the metal were overheated? What if the original metal were not thoroughly melted when the molten rod was dropped upon it? A man must know more than a blacksmith about hot metals to be an oxy-actylene welder. Could such men be gotten and could their skill be relied upon? We know the encouraging answer to these questions now, but they recall to some at least the time of not so long ago when the mechanical engineer struggled with his welders to teach them the difference between molten metal and burnt metal. We venture to say that it will be much easier to make good oxy-actylene welders from now on than it has been heretofore.

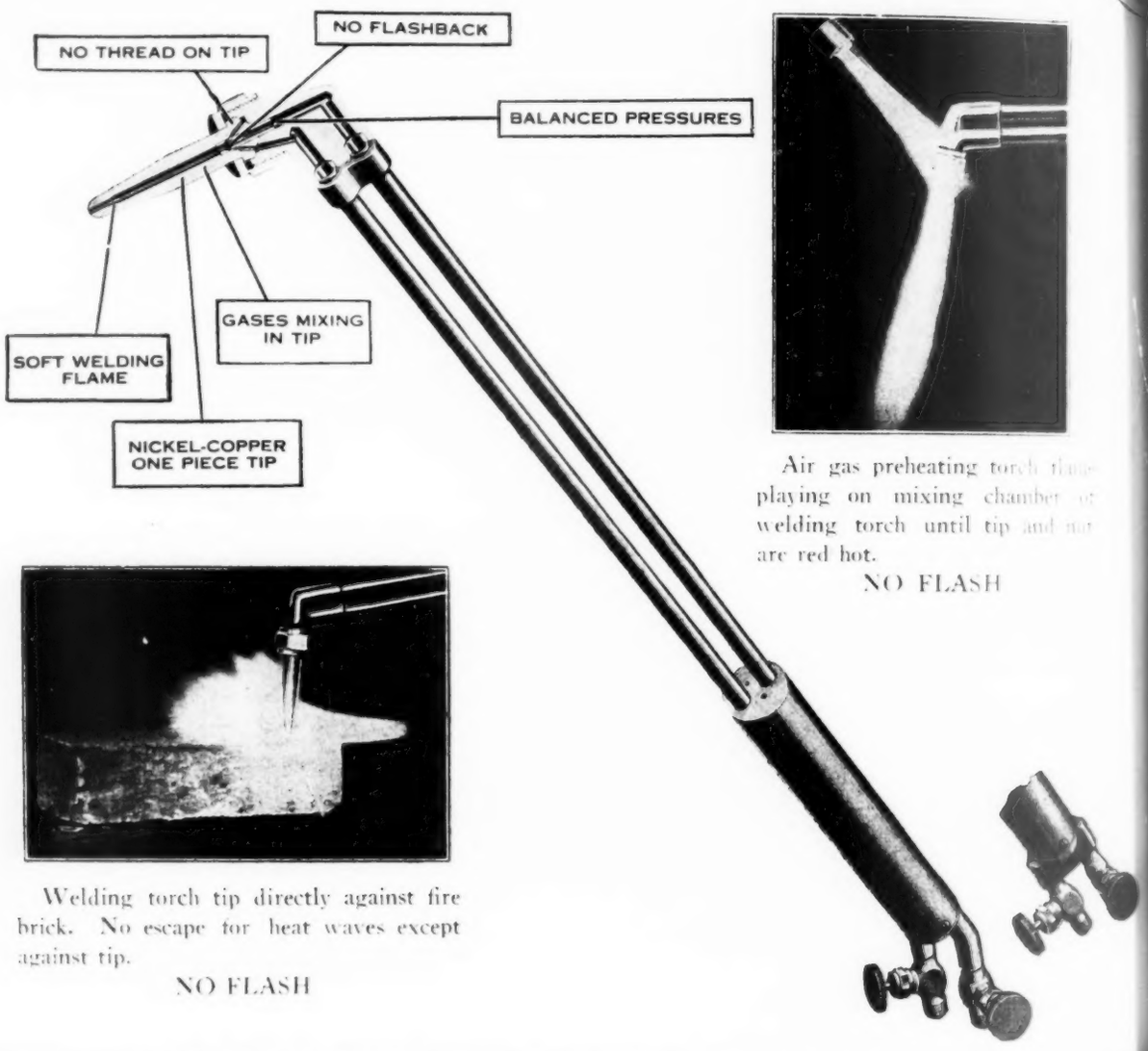
In this connection it may be of interest to describe the results of some work performed by the author, as an effort to help win the war. At that time, as you know, there was a great need of the use of the oxy-actylene welding and cutting of metals. Trained welders were scarce and many men were being pressed in the work without proper knowledge of the way it should be performed. At the request of those in charge of these men it became our privilege to form a night school for oxy-actylene welders at the Twenty-third Street Y. M. C. A., New York. The course consisted of lectures on the metallurgy and general principles of the work followed by the actual use of the welding and cutting torches on special jobs in the shop. We took in men who were working on war orders in the shipyards and other large shops, and also any other men who would learn to be welders and take positions in the shops during war work. Over 200 men were trained the first year, about 75 per cent of whom proved to be successful welders so far as we have been able to follow them up. It was easy to see why these men were failing in their daily labors with the torch, and their rapid advancement after a few evenings of instruction clearly proved the importance of a special training in the subject. As a more marked illustration of the value of such a training, however, we may mention an experiment in this same evening school of a special class selected from the non-essential industries. The men had been earning a livelihood as furniture salesman, laundryman, hat dyer, printer, bookkeeper, waiter, plasterer, signalman, art student, saloonkeeper, etc. Seventeen out of the twenty in the class became good welders, and went to work in shipyard and shop with a zeal that was surprisingly new to them.

To continue this subject a bit further it will be apropos to call attention to the attitude of the technical engineer toward the teaching of the oxy-acetylene processes in the engineering colleges. Some of these institutions were not slow to grasp the importance of the subject. The Stevens Institute of Technology was probably the first college to take up the work. The author has lectured for about ten years on the subject as head of the Department of Shop Practice in that institution and sometime ago we added a course of jobs to be welded by the oxy-actylene torch which every student at Stevens has been required to take. We have heard of other engineering colleges who have introduced such a course, and we understand that Harvard's new Engineering School is about to include oxy-actylene welding in the instruction of its shop department.

In college and abroad, in the world of engineering construction and repairs, the technical engineer has ben giving careful thought to the possibilities and advantages of oxy-acetylene welding. He has encouraged its trial in shop foundry and manufacturing plant. He has studied its evolution from the rough joint of doubtful value to the homogeneous weld of nearly 100 per cent efficiency. If he has been conservative in his judgment it was because he knew better than others of the undeveloped parts of the new field being entered by the welder, if he has appeared to be slow to accept the process for the most important high pressure and high tensioned work it is because he has waited to prove that the new welder could measure up to his increased responsibility. One thing he will not do, he will not forget the inherent crudeness of the work, nor the varying personal error of the best of workmen, and expect impractical refinements. A small fraction of sulphuretted hydrogen and phosphoretted hydrogen in the acetylene or a little difference in the purity of oxygen will not disturb his acquired confidence in the possibilities of a good weld by the new process. He has learned to appreciate the difference between a 50 per cent plastic weld and 90 per cent fusion weld.

The author has discussed oxy-actylene welding with many of the leading technical engineers of the country, men who are in responsible charge of immense engineering plants. Five years ago almost all of these men would have advised a delayed acceptance and further study of the advantages of the process. Today they do not hesitate. Their minds are made up. From study and experience they speak, and because of the nature of the heat supply which can easily be made a non-oxidizing reducing flame, because of the effect of the process on the physical efficiency on the actual weld, because of the portability of the welding apparatus, and because of the economy of the process, their judgment is that the oxy-acetylene process of welding metals is an engineering success and a fine commercial asset.

WELDING AND CU



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NO FLASH

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The REGO Principle was brand new in the oxy-acetylene industry when the REGO torch was brought upon the market in June, 1918.

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Our offer to send REGO apparatus to any user of the welding and cutting process on a trial basis has met with severe criticism by competitors, who maintain that we should not do so. The fact remains, however, that **REGO apparatus put out on trial, stays put.** If we did not have a Principle of torch construction radically different and distinctly better, we could not afford to make this trial offer.

REGO welding torches can be operated with any medium pressure generator. The acetylene required is only slightly more than any medium pressure torch uses, and considerably less than most torches designed on the partial injector or medium pressure principle.

If you are unacquainted with the REGO Principle of torch construction, send for our literature. We have an outfit for every purpose, and at prices which will interest you.

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THE USE AND MISUSE OF ARC WELDING APPARATUS

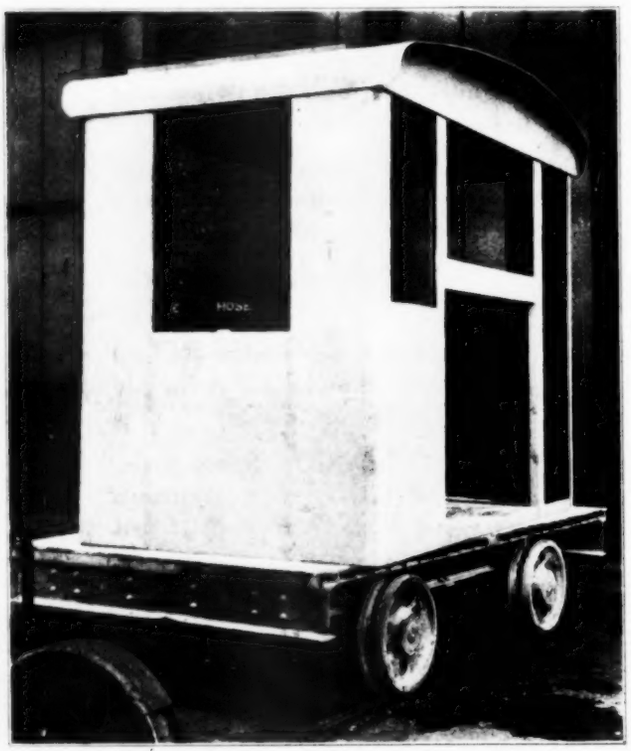
By H. L. Unland*

There are several simple precautions to be observed in the use of electric arc welding equipment whatever the nature of the apparatus may be.

Many of the accidents which occur are generally the result of a misconception of the nature of the equipment and its proper use. This applies more particularly to the auxiliary apparatus.

The eyes should be thoroughly protected from the light of the arc. Painful and more or less serious burns of the interior of the eye will certainly result from carelessness in this respect. No chinks or holes in the mask should be permitted, since only a brief exposure of the eyes is required to bring on painful results. The inside of the mask should be kept painted dull black to prevent reflection of the light from behind.

The mask is principally used where carbon electrode welding is being done. It consists of a thin sheet of aluminum formed to the proper shape and provided with an adjustable band for supporting it from the operator's head. An opening in the front of the mask is provided for a window of glass. This glass may be either a number of individual sheets of different colors or a single compound sheet of glass may be used.



Locomotive Cab—All Welded.

The colored protective glass should be sufficiently dense to reduce the light intensity to a value not objectionable to the eye and at the same time the definition of the area immediately around the arc should be clear, to enable the operator to properly follow the work. Different color combinations are used, but the most general seems to be a combination of red and green glass.

The glass is held in a recess in the front of the mask by means of a clamping frame secured by four small bolts. By this means it is rendered impossible for light from the arc to pass through joints or cracks around the edge of the glass. The bolts should always be in place when the mask is used, as the small amount of light coming through one of these openings would in a short time affect the eyes of the operator.

To change the glass, the bolts and clamping frame are removed, the glass changed and the frame and bolts replaced. It is advisable to keep a piece of clear glass on the outside, since in welding this outside surface will be struck by numberless particles of molten metal, and will become roughened to such an extent that it becomes useless and must be replaced.

The Hand Shield

The hand shield is principally used in doing metallic electrode welding. It consists of a light wooden frame with provision for a protective glass window. The protective glass is the same as used in the mask. The shield is also used by inspectors and others who require the protection only for short periods and at infrequent intervals. A light box frame surrounding the window is fitted to the operator's face, preventing light from the side or rear reaching the operator's eyes, thus eliminating any interference of a number of operators, due to the light from the arcs. The protective glass of the hand shield is supported in guides on the front of the shield, and is clamped in place by a wooden wedge driven through openings in the guides.

Electrode Holders

The function of the electrode holder is to electrically connect the electrode used to the cable connected to the welding equipment. The requirements of this service are:

First: It must securely grip the electrode so the welder can operate it without play in the mechanism or without the electrode becoming loose in the holder while being used.

Second: The clamping arrangement should be such as to facilitate changing electrodes.

Third: It should be so constructed that the minimum heat reaches the operator's hand.

Fourth: The weight should be as low as possible, and the balance such as to facilitate manipulation by the operator.

Fifth: The construction should be such that the operating parts are protected from accidental contact to avoid injury by burning or being struck.

Sixth: The general construction should be substantial to avoid light or flimsy parts subject to bending or jamming.

Electrodes

Carbon electrodes should be rods of hard, homogeneous uncored and uncoated carbon. The diameter used will vary with the current to be used, and this information is given elsewhere. The length depends on the particular class of work to be done. Long carbons reduce the percentage of short ends thrown away but are more liable to breakage. The average lengths range from 9 to 12 inches.

For welding iron and steel the metallic electrode should be a high grade of low carbon steel wire. A large number of tests were made by the Emergency Fleet Corporation, to determine the best chemical analysis of wire for this purpose, and the wire now made by a number of manufacturers meets these requirements. This material can be purchased either direct from the makers or through jobbers, and can be obtained either in rolls or in short lengths, cut and straightened. In ordering "Electric Welding Wire" should be specified, since wire for acetylene welding is often treated in such a way as to render it unsuitable for electric welding.

The electrode wire should be cut into pieces convenient for the operation. A length of 18 inches is satisfactory since it is about the greatest length an operator can handle; at the same time it reduces the number of times the electrode is changed, and consequently the wastage, to a minimum.

Cables

On account of the intermittent nature of the work it is possible to use smaller cable for the wedding circuits than is standard for the current capacities. In this way, there is also a gain in flexibility which permits better control of the welding arc, by facilitating the manipulation of the electrode holder.

*Power and Mining Engineering Dept., General Electric Co.

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are steadily increasing in popularity, especially among welders who are building up a reputation for quality of work and reliability. Each new ARMCO enthusiast passes on the word that this strictly American product surpasses in purity and uniformity even the best grades of Norway and Swedish iron. The result is a rapidly growing insistence for ARMCO and our response with the coast-to-coast distribution shown below.

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ARMCO IRON Welding Rods have a guaranteed analysis of 99.84 per cent pure iron content (minimum)—a practical purity which insures complete and uniform cohesion and maximum strength of the welded section. Such purity also makes it possible for two kinds of rods of guaranteed ARMCO analysis, one specially treated for electric and the other for oxy-acetylene, to do all the work (and **better** work) that heretofore has required a wide range of filler compositions.

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The uniform composition of ARMCO IRON Welding Rods, as determined before drawing by microscopic and chemical analysis of samples from various parts of split ingots, is another assurance of tough welds that will endure the most severe service and reflect credit upon the welder. This uniformity also insures free flowing of the welding material and a joint that can be hammered, forged, and, when necessary, annealed and quenched. Operators produce their best work when they use ARMCO Rods.

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43

In metallic electrode welding a length of at least fifteen (15) feet of extra flexible cable should be connected to the electrode holder to allow the operator to fully control the arc through manipulation of the holder. For the ground or return cable the standard extra flexible apparatus or dynamo cable insulated with varnished cambric for low voltage circuit and covered with double weatherproof braid has been found suitable.

The carbon electrode welding arc is not as unstable as the metallic arc, and, therefore, the manipulation of the electrode is not so important. For this reason the standard extra flexible dynamo cable referred to above may be used for connection to the electrode holder, as well as for the return circuit.

It is difficult to give universally applicable figures covering amperes, speed, etc., for electric arc welding, due to the effect of conditions under which the work is done, the character of the work, and to a very large extent the skill of the operator.

The following figures are based on favorable working conditions and a skilled operator. However they are approximations only, and are given merely as a general guide:

Metallic Electrode Welding

Light Work ..... 25 to 125 amperes
Heavy Work ..... up to 225 amperes

Electrode Diameter Inches	Amperes	Correspondence Plate Thickness Inches
1/16	25-50	up to 3/16
3/32	50-90	up to 1/4
1/8	80-150	1/8 to 3/8
5/32	125-200	1/4 up
3/16	175-225	3/8 up

The same size electrode may be used with various thicknesses of plate; the heavier plate will require the use of the heavier currents.

Approximate speeds of welding sheet metal with the metallic electrode are given in the following table:

Thickness Plate	Speed Feet per hour	Cost per foot	Comparative cost per foot Acetylene
1/8	20	2.12	1.78
3/16	16	3.12	4.66
1/4	10	7.13	13.1
3/8	6.5	12.3	36.1
1/2	4.3	19.8	much higher
3/4	2.0	41.7	much higher
1	1.4	61.3	much higher

The above figures are based on average figures for materials and labor. They will probably vary considerably for different localities and will vary slightly with the type of equipment, but the relative costs of gas and electric welding will in general hold true.

Carbon Electrode Welding

The carbon electrode can be used for welding and for building up metal in a large number of cases where the metal is not subjected to high strains or where it is under compression only. This process can be used to a very large extent in rough cutting of plates and structures.

The average current ranges for different types of work are as follows:

Light welding ..... 150 to 250 amps.
Medium welding ..... 250 to 350 amps.
Heavy welding and medium cutting..... 400 to 600 amps.
Very heavy welding and heavy cutting.... 600 to 1000 amps.

The maximum values of current permissible for the carbon electrodes are as follows:

Diameter of Electrode	Maximum Amperes
1/4 inch	100
1/2 inch	300
3/4 inch	500
1 inch	1000

Graphite electrodes permit the use of somewhat higher current densities, but the higher cost of graphite electrodes is a serious handicap to their use. Lower currents than the above may be used, but higher values will result in undue burning of the electrode.

For depositing or building up metal by means of the carbon arc on flat surfaces where the work is accessible and all conditions favorable, the following figures may be used:

Current Amperes	Inches per hour	Cu. Inches per hour
200	1½	5.4
300	3	10.8
400	4½	16.2
500	6	21.6

For continuous work the above figures may be used, but for short jobs of ten minutes or less the rate will be double the above.

NEW WILSON APPARATUS

A new Plastic-Arc welding unit has just been brought out by the Wilson Welder & Metals Company, 2 Rector Street, New York.

This set is composed of a dynamotor and current control panel. The generator is flat-compound wound, and maintains the normal voltage of 35 on either no load or full load.

The control panel contains many new features. It has been designed to provide a constant-current controlling panel, small in size, of light weight, *simple* in operation and high in efficiency.

The panel is of slate 20 x 27 inches and on it are mounted, a small carbon pile, a compression spring, and a solenoid working in opposition to the spring. The solenoid is in series with the arc, so that any variation in current will cause the solenoid to vary the pressure on the carbon pile, thereby keeping the current constant, at the value it is adjusted for.

This is the well known principle of the Wilson control of constant *heat* in the *weld*. Practically any metal can be welded with this outfit, without preheating or annealing, which are so troublesome.

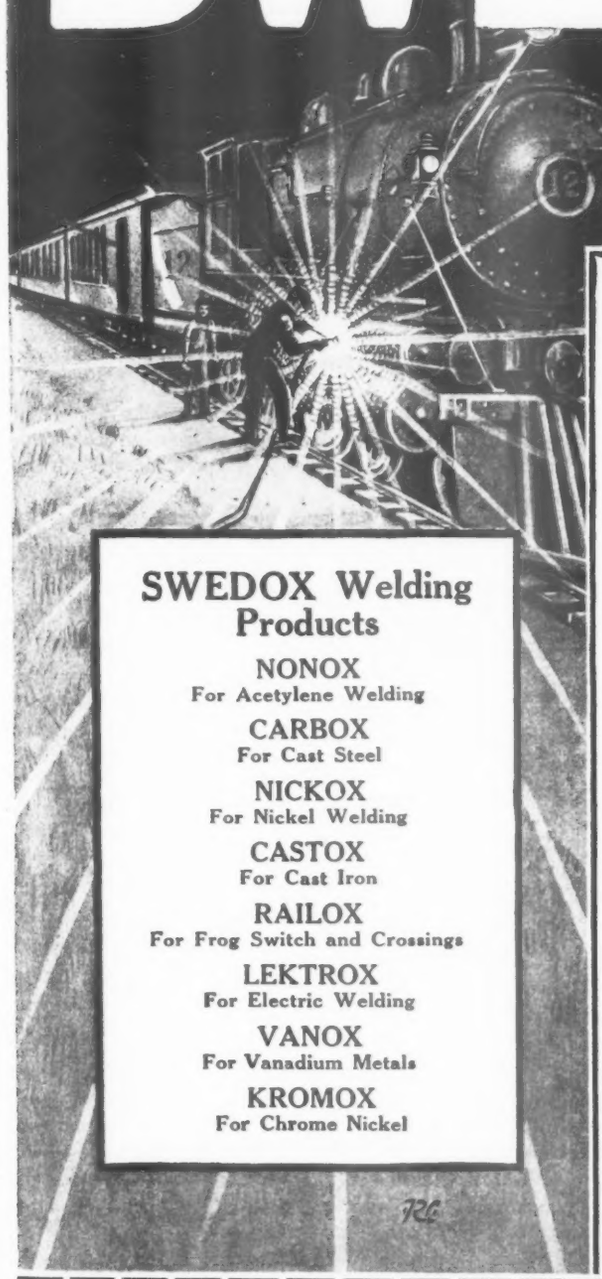
Three switches on the panel provide an easy means of current adjustment, between 25 and 175 amperes. The arrangement of the welding circuit is such that 25 amperes always flows through the solenoid, when the main switch is closed, whether the welding current is at the minimum of 25 amperes, or the maximum of 175 amperes. The balance of the welding current is taken care of in by-pass resistances shunted around the solenoid.

This outfit can be furnished as a dyanomotor unit, with standard motor characteristics, as follows: 110 volts, 220 volts, D. C., or 220, 440 volts, 60 cycle, 2 or 3 phase A. C. Also as a gasoline-driven unit, or it can be furnished without a motor, to be belt-driven. The normal generator speed is 1,800 R. P. M. The net weight of this new outfit in standard characteristics is 800 lbs. with D. C. motor, 897 lbs. with A. C. motor, 1,200 lbs. with gasoline engine, and 550 lbs. as a belted outfit without motor. These new dynamotor sets can be mounted on a truck for portability, if desired.

FOUNDRYMEN'S CONVENTION AND EXHIBIT

The American Foundrymen's Association will hold its twenty-fourth annual convention at Exhibition Hall, Commercial Museum, Philadelphia, Pa., September 29 to October 3. The fourteenth annual exhibit of foundry and machine shop equipment and supplies will be held in conjunction with the convention. Information concerning rules and regulations governing the 1919 exhibit can be obtained from the American Foundrymen's Association, Department of Exhibits, C. E. Hoyt, manager, Harris Trust Building, 111 West Monroe Street, Chicago, Ill.

SWEDOX Welding Rods and Wire



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SWEDOX fillers are the result of years of severe laboratory and shop tests by the country's leading metallurgists. We found the proper welding materials suited to different metals, thus giving you an individual, specialized service. We made them uniform in analysis and free of impurities.

The choice made possible by eight distinct fillers, all members of the SWEDOX family, gives a range of usefulness so wide that every standardized welding task can be solved by a SWEDOX filler. The resulting increased economy and satisfaction cannot be estimated.

Here then are the fillers you should have. We want you to try them. We are willing to have our sales depend on our concretely proving to you the truth of what we claim. But send the coupon out *today*.

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Dept. 62, 119 North Peoria St., Chicago

TRAINING WELDERS IN THE ORDNANCE DEPARTMENT†

By R. J. Kehl*

Originally the shop work of the Ordnance Department was planned to come under two heads, namely, mobile repair shops and base shops.

The mobile shops organized quite elaborate courses of instruction, which were given at the Rock Island Arsenal, at Peoria, Illinois; Clintonville, Wisconsin, and Kenosha, Wisconsin. Because those shops were to be sent to France one at a time, it was quite possible to arrange good courses of training for their men. Men who had some welding experience and men who were good mechanics, but who had no previous experience in oxy-acetylene welding, were given instructions at these schools.

In the case of the base shops, conditions were entirely different. It was expected that all the base equipment and personnel would arrive in France early in the spring of 1918. These shops, therefore, endeavored to enlist men who had had considerable experience in oxy-acetylene welding, as well as for the other trades required for the shops. It was, of course, understood, that there would not be enough first-class operators, but it was thought that we would be able to train men in France, using them as helpers to the experienced welders.

When I arrived in France, in March, I went immediately to Advance Depot No. 1. The first machine shop, which had been erected in December, had burned down and the second shop was just about ready to commence operating. Considerable machinery had been damaged in the fire. When I inquired as to why a welder had not been put on and in transportation, and a great deal of welding work had the job, I was told that they did not have one. They had had a blacksmith who claimed to know quite a bit about welding, but he had made a failure of every job which he had attempted, so, although they knew that their only hope for getting the shop running was to employ the oxy-acetylene process, nevertheless, they had very little faith in its ability.

The only equipment at the depot, was a French combination welding and cutting blowpipe, supplied by a portable acetylene generator of about 5 pounds carbide capacity. There was no oxygen regulator with the outfit. A copper tube about ⅛ inch in diameter carried the oxygen to the blowpipe at cylinder pressure. Four cylinders of oxygen, and two of acetylene, of about 150 cubic feet each; about 10 pounds cast iron rods, all square, and most of them larger than ⅜ inch; and about 5 pounds square aluminum rod over ½ inch, were all the supplies on hand.

Lump carbide was the only size available; so it was necessary to break carbide to charge the generator, as the instructions said to "the size of coffee."

After the generator had been put in operation and the blowpipe started, it was apparent that a beginner could not be trusted with that apparatus on work that could not be allowed to fail. Therefore, for the first five weeks, I had to do practically all the welding myself, using the men only as helpers, except for a few cutting jobs.

About the first of May we received in salvage a good French outfit consisting of a welding blowpipe, a cutting blowpipe, oxygen regulators, and an acetylene regulator. With this better equipment we were able to get along quite well.

Soon the mobile shops commenced coming through the depot to receive final instruction in artillery material and other work for which the men were to be specialists with their particular shop. Some of the welders with these shops were excellent operators; some had had instruction in the mobile classes in the States, but a great many, although road repair shop, and other branches of the service at the depot, and some artillery repairs.

To give instruction on work of this sort was a pretty difficult proposition. Men who were good mechanics and adapted themselves readily to welding, received considerable training, and quite a few good operators were turned out. But those who did not adapt themselves to welding readily and should have been given the most attention and practice did not receive it, because they could not be trusted to do anything but the simplest jobs.

The work covered a broad range of repairs and included jobs which ordinarily would not have been attempted. Such parts as typewriter arms, typewriter carriage ways, various small arms parts, automobile springs, and very they were classed as welders, knew practically nothing about welding, or at least good welding practice.

Most of the work up to July was repairs to broken machinery and equipment for our own shop, the local railroad badly broken castings were attempted and successfully handled. The only job which failed was a small white metal casting.

Dozens of levers, arms, hand-wheels, brackets and pulleys for various machine tools were welded for our own shops each week. For the Air Service, a broken shaper base and aluminum magneto brackets for generator and sets were repaired, and some lead burning was done. For the Railroad Shop, only locomotive brackets, levers, and other small work was welded by us, the larger repair work being sent to the main railroad repair shops, about 150 miles back. For the Motor Transport Corps, cracked engine cylinders, motorcycle forks, worn valves, and other automobile and motorcycle repairs were made. Even several dozen automobile springs were welded because of the inability to obtain new springs to replace them. Broken truck and tractor parts were repaired for vehicles received from the States and uncrated at the depot. Hot water heater sections and automobile repairs were handled for the Red Cross.

Perhaps the most complicated job was a three step pulley for a 16-inch lathe, which had fallen down from the shafting and was broken into 15 parts, all the way from small pieces to one piece about one-third of the pulley. This job required considerable patch work and scheming to insure the pieces being true and to avoid cracking as each little piece was gradually added to the main part.

Various parts of gun mounts, gun carriages, and other caissons were repaired. Many of these were bronze. Machine gun tripods which had come in in salvage with corners shot off, holes pierced through them, and otherwise damaged, were welded, straightened and put back in service. Upon several occasions, advantage was taken of the oxy-acetylene blowpipe to apply local heat to trails which had been distorted in action.

The cutting blowpipe was used to cut I beams for shafting stringers and to rough out large quantities of wrenches for the 75 millimeter gun repair tool sets, to save time in machining. The ball and the base of railroad rails were sliced off so that the machine shops could use the stock to make lathe and shaper tools. By careful manipulation of the cutting blowpipe, gun cradles were notched or split, as the case required, to permit the removal of the gun and recoil mechanism from field pieces which had been badly damaged in action.

In July, the shops received orders to make up about 200 Howitzer mounts, each of which required two butt welds on 8-inch round steel bars, and two corner weld each 15 inches long, on ¾-inch plate. After the shops had been on this work for about a week, the welders were falling behind

†Read at the Annual Convention International Acetylene Association, New York, July 15-17, 1919.

*Engineer, Oxweld Acetylene Co., formerly First Lieut. Ordnance Dept., A. E. F.

Oxy-Acetylene **U.S.** Equipment

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Every Oxy-Acetylene and Electric Arc welder has undoubtedly felt the demand for a fire resisting compound which could be moulded into any desired shape. When building up metal around holes in castings, and where welding is necessary thru a machined part, such as a bearing, much time and machining can be saved in addition to making a neater appearing job by employing such a compound. Carbon blocks and rods have their field, but it is very limited. "Welder's Moulding Compound" can not only be used wherever carbon has been, but it has a much wider field. Moulds can be made for any missing lugs or parts and new ones cast that have all the appearance of having been machined. Aluminum parts may be "backed-up" preventing the collapse of the metal when heating.

For aligning broken sections, whether large or small, the usual shimming process may be forgotten and much time saved by using this compound as a cushion for the work. It can be used in hundreds of different ways, over and over again—it don't wear out. The wide awake welder will appreciate its true worth.

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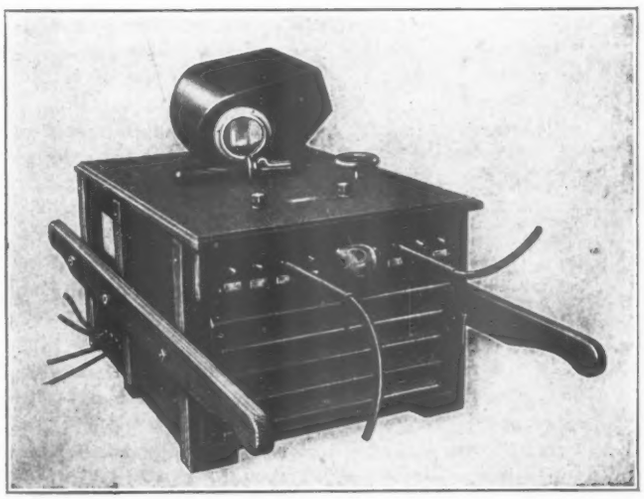

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Electric Arc Cutting & Welding Co.

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because of lack of equipment. At that time the Engineers at the depot received a 100-pound portable Oxweld Generator, with welding and cutting equipment. After considerable negotiations, they finally consented to loan us their generator and equipment on the basis that we would handle all their repair work. When I say that we had eight men doing nothing but break lump carbide down to the size required for the generator, you will realize that the generators were being heavily taxed.

Because most of the men were to go out with mobile shops, and would have to depend upon their own ability and skill, an effort was made to have them appreciate that the success of welding depends more upon the correct handling of the work than just upon running in the filling rod. They were instructed to study the different possible methods of a job and to then select the method which would insure the best results. They were trained to watch the whole work, while doing the actual welding, and be able to reason out the cause of any difficulty they might encounter, and be able to overcome or counteract the cause.

EXHIBIT OF WESTINGHOUSE ARC WELDING EQUIPMENT AT INTER-ALLIED FOUNDRYMEN'S EXHIBIT AT PHILADELPHIA.

Foremost among the very interesting features at the Inter-Allied Foundrymen's Congress and Exhibit to be held at Philadelphia, Pa., September 29 to October 3, is the splendid exhibit of Westinghouse electrical apparatus which includes the latest scientific development in the art of arc welding, which relates directly to the foundrymen's business.

The arc welding equipment consists of one 500 amp. arc welding motor generator set and is made up of 3 phase, 440 volt, 60 cycle Westinghouse type "CS" motor mounted on a common shaft and bedplate with a 500 amp. 60 volt arc welding generator.

The control panel consists of a combination generator control and outlet panel for graphite electrode welding. The equipment provided for the control of the generator consists of circuit breaker, field rheostat, ammeter, voltmeter and necessary knife switches. By means of the resistance switches mounted on the combination panel, current values of from 150 to 550 amperes may be obtained in six steps.

An additional outlet panel for metallic electrode welding is exhibited. This panel provides for current values for metal electrode welding of from 25 to 190 amperes and for graphite electrode welding of from 225 to 350 amperes.

This combination provides a flexible outfit for foundry use. Comparatively heavy graphite electrode work may be carried on or light carbon welding metal electrode welding can be accomplished at the same time. The generator is large enough to supply energy for several metallic electrode welding circuits, if no carbon electrode welding is performed.

The accessories exhibited consist of operator's hood and shield, graphite electrode holder, metal electrode holder and an adapter for equipping the metal electrode holder for light graphite electrode welding.

A feature of the graphite electrode holder is its ability to remain in continuous service for long periods of time without heating up to a degree uncomfortable to the operator.

BLOWHOLES IN CAST IRON WELDS

Question.—In carrying out repairs on cast iron we continually find numerous pinholes on the surface of the weld and blowholes in the interior of the welds. What is the cause of these? F. M. & Co.

Answer.—One of the commonest defects produced in welding cast iron is the presence of pinholes and blowholes. If these are distributed throughout the weld they are probably caused by oxidation. Blowholes in particular parts of the weld are usually produced by the interposition of oxide. The first depends upon the temperature of the metal and the more or less oxidizing temperature of the atmosphere [illegible] flame. It is important to use good blowpipes and to see that they are carefully regulated with as low a pressure of oxygen as possible. The white cone of the flame should be some distance from the molten metal, to avoid overheating. The latter requires a good flux, for if the oxide is not removed, it is attacked by the molten cast iron, and leads to the formation of blowholes.

If the surfaces to be welded are not thoroughly cleaned, blowholes are inevitable.

If there are blowholes in the neighborhood of where the added metal joins on to the original metal, these are generally due to the melting being too rapid and too superficial. The remedy is obvious.

Blowholes near the surface are due to the rapid cooling of the surface. If the metal bubbles, the welding rod may not be satisfactory or the flame may be oxidizing. Progressive removal of the blowpipe is required.

The diminution of blowholes by the use of filling materials containing excessive quantities of manganese, phosphorus, silicon, and sulphur generally leads to failures and weakness of the joint.

The elimination or reduction of blowholes in cast iron welds is dependent upon the skill of the welder and the use of first class filling materials, i. e., silicated cast iron rods and fluxes. The latter is generally overlooked, very few firms call for material to specification, and most firms will not pay the extra price for a good material, although this forms a very infinitesimal cost of the work.—By D. R., in *Acetylene and Welding Journal*, London.

TESTS FOR STEEL WELDING WIRE

Question.—In welding mild steel with the oxy-acetylene blowpipe, is there any simple test or guide which would indicate that the welding wire is satisfactory?

M. P.

Answer.—The welding wire used in welding mild steel should be as pure as possible, and previous to use should be submitted to a melting test under the blowpipe with a view to getting an idea of the quantity of gas it is capable of absorbing. Welds made on steel with a filling material which is unsatisfactory, invariably contain traces of oxide and numerous blowholes. A wire which may be excellent from the point of view of mechanical porperties, is often of little value for oxy-acetylene welding. A good welding wire should not absorb gas, and a sudden removal of the blowpipe should not produce bubbling of the metal. A metal which bubbles or "rochages" under the flame, should not be used, as the welds produced will be riddled with blowholes.

If the blowpipe is suddenly removed from the molten metal, the metal, on cooling, liberates the gases which have been absorbed in the liquid state, and these gases endeavor to escape by rising through the mass of metal. If they are arrested, owing to the surface of the metal solidifying, they will remain imprisoned in the upper portion of the weld, forming numerous blowholes and diminishing the section of the weld.

If this test is made with a welding wire of bad quality, which readily absorbs gases and *foams* under the blowpipe, an interesting result is obtained. The large quantity of gas dissolved by the welding wire forms at the moment of solidification a superficial crust, with the result that a large hollow blister is formed near the surface of the metal.—By D. R., in *Acetylene and Welding Journal*, London.

Lieut. Lorn Campbell, Jr., (U. S. Welding Co.) announces that his forces have been strengthened by the arrival on Sept. 9th of two daughters.

LINCOLN ARC WELDER

20% More Work Per Day

The steady arc assured by the stabilizer feature of the Lincoln Arc Welder means *more work per day.*

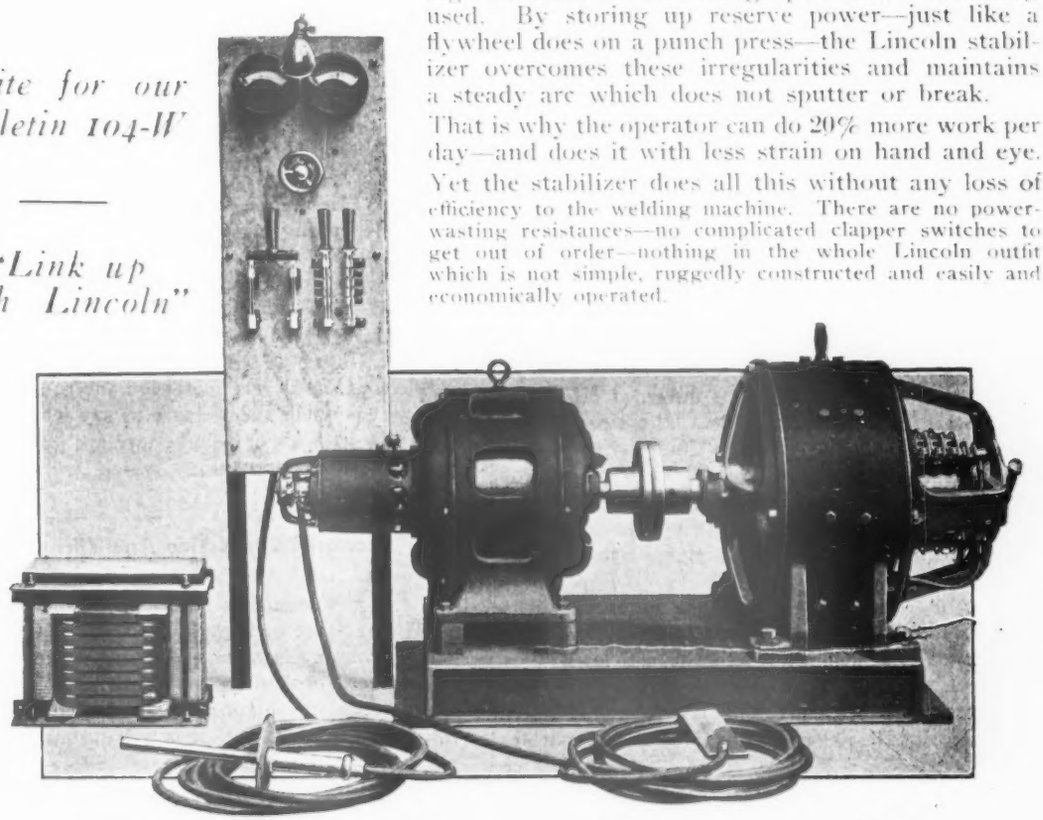
Write for our Bulletin 104-W

"Link up with Lincoln"

The resistance of a welding arc varies every instant, because of the uneven surface and the varying resistance of the casting upon which it is being used. By storing up reserve power—just like a flywheel does on a punch press—the Lincoln stabilizer overcomes these irregularities and maintains a steady arc which does not sputter or break.

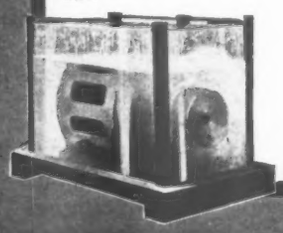
That is why the operator can do 20% more work per day—and does it with less strain on hand and eye.

Yet the stabilizer does all this without any loss of efficiency to the welding machine. There are no power-wasting resistances—no complicated clapper switches to get out of order—nothing in the whole Lincoln outfit which is not simple, ruggedly constructed and easily and economically operated.



Stabilizer Control Panel Motor Generator

This Standard Lincoln Motor operated over 3 years under water without damage.



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We Stubbed Our Editorial Toe.

AS most everyone who has been reading *The Welding Engineer* for the past three years must know, it has been our pet ambition to remain absolutely neutral, so far as the indorsement of any particular method of welding is concerned. We have always believed, and our opinion is unchanged, that each of the advocated systems of autogenous welding has its specific field, and we have also felt that our right to prosper was based upon the fact that a number of manufacturers were marketing welding apparatus which, while personal preferences might differ, at least commanded the respect of the welding trade. Therefore, in publishing a recent article in *The Welding Engineer*, which contained a rather decided statement, we did so without proper consideration, as we believe the article in question contained a statement which is so worded as not to express the true thought of the author, and certainly not the opinion of the editor.

We are, therefore, glad to publish herewith a letter from Mr. A. F. Jenkins, president of the Alexander Milburn Co., Baltimore, Md., which relates to the article in question:

"On page 20 of *The Welding Engineer*, for May, under "Oxy-Acetylene Apparatus and Its Accomplishments," by Captain George N. Sieger, M. T. C., the article states as follows:

"'In purchasing equipment for this division, the general policy was pursued, viz., that of obtaining only the best. In the selection of welding and cutting units the choice offered just a little difficulty. The gas plant offered less difficulty as the manufacturing field was comparatively smaller. However, after very careful investigation and consideration, it was found that only one concern—the Davis Bournonville Co.—could supply not only high-grade welding and cutting apparatus, but also efficient gas generating plants as well.'

"We believe that the statement is incorrect and misleading. There are a number of concerns manufacturing high-grade welding and cutting apparatus and also efficient gas generating plants. Such a statement 'that only one concern,' viz., 'the Davis Bournonville Co.,' is entirely unjustified.

"Our company, for instance, manufactures various sizes and high-grade gas generating plants, which are already in a large number of Government installations and its oxy-acetylene welding and cutting apparatus is of the highest possible type. Such we know to be the case with other manufacturers.

"I do not believe that your journal can afford to let articles of this kind appear without being properly edited, and I trust, in fairness to other manufacturers and subscribers to advertisers in your journal, that it will be able to maintain a position of impartiality."

The High Cost of Living.

THE solution of high living costs rests with the people at large. Until we shake off our present spending intoxication and settle down to demanding the receipt of a dollar's worth of food or material for every dollar we spend a solution cannot be reached.

One method is to keep a firm hand on the savings forced on us during the war, not only as a matter of selfish gain but as a factor in bringing prices down.

War Savings Stamps are still one of our best bets. We won the war, but it is up to us to decide whether or not we have enough horse sense to go South with the profits.

Trusting To Luck.

THE old-time business man trusted to luck. If business was good, it was good. If it was bad, too bad, he must make the best of it.

The modern business man believes in initiative. He believes that business is never so good that he cannot improve it by effort. And by his initiative he has moved the old timers to the side streets and the back alleys, where they generally drop out of the running. He plans and he executes.

The man who is running a job welding shop and who is depending upon work "dropping in" on him is asleep at the switch. The art of autogenous welding is so remarkable and bears such a close relationship to the present-day need of strict economy that the man who hides his light under a bushel is overlooking one very good little opportunity.

Under all circumstances the time to advertise is all the time. The war advanced the cause of welding several years. It is up to the welders to say whether time is going to catch up with us, or whether we are going to take every advantage of the opportunity which confronts us. Let's advertise welding.

Increased Production And Thrift.

A GOVERNMENT publication tells us that "Increased Production And Thrift" spells the solution to our present "cost of high living issue." One very positive means of economy is to put back in service every broken machine and every broken part. It will save labor and delay and will increase production. The story of "Doctor Welder" had been created for him—it is a hand-made opportunity. If we take every opportunity we are offered we ought to take welding out of the "Tinker" class and make the art a very substantial part of industry.

DIE CASTINGS.

Die castings cannot be welded commercially, due to the fact that when they break they are in a bad condition all through. They are made of tin and aluminum mostly, such an alloy becoming brittle in time. It is best to secure all castings made of brass, which can usually be done by using the broken part as a pattern.

NEW ELECTRIC ARC WELDING CATALOG.

"Electric Arc Welding" is the title of a new catalog issued by the Westinghouse Electric & Manufacturing Co., and which contains fifty pages of very useful information and interesting information. A copy will be sent upon request.

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PRODUCTION SPEED BY OXY-ACETYLENE CUTTING†

By R. R. Browning*

During the course of this Victory Convention we have listened or will listen to a number of excellent papers on War Applications of the Oxy-acetylene welding process. These articles, as well as the large number which have appeared in trade papers, are of the greatest interest to those in the industry, proving, as they do, the wonderful development of the process in the field of production.

The majority of these articles deal principally with welding applications, and the very important part which oxy-acetylene cutting took in war work has been given little or no attention. This neglect is not intentional, but is due to the fact that oxy-acetylene cutting so naturally fitted into war production that even those who used it hardly gave it proper credit.

Business men in this country knew early in 1916 that production of war material would have to be speeded up to meet the demands of the Allies. This speeding up process was general throughout all essential industries, and the value of the oxy-acetylene cutting process—always in the first ranks as a time and money saver—commenced to be recognized more thoroughly as a necessary part of the production system.

The demand for steel of all kinds to be used in shells, ships, guns, artillery, etc., became tremendous, with the logical result that scrap metal was required by the thousands of tons. The use of the oxy-acetylene cutting process in wrecking old boilers, ships, tanks, etc., for steel scrap, increased to such a point that portable outfits were carried to most inaccessible places in country districts, the process applied, and charging box steel scrap produced for shipment to the mills. It truthfully can be stated that without the oxy-acetylene cutting proces the scrap market would have been in an absolute panic to supply the tremendous tonnage demanded.

With the inauguration of submarine warfare by Germany it became immediately apparent to the American shipbuilding industry that steel ships, without number, would be required. The oxy-acetylene cutting process—which since its introduction into this country has been used by the steel ship builder—was one of the first processes to be called upon to speed up production in old, as well as in new, shipyards. The development of the applications in the shipyards occasioned by the demand for more ships was a matter given special attention by the Welding Committee of the United States Emergency Fleet Corporation, by the American Bureau of Shipping, and by Lloyds. The result was the application of the process to such important work as the following:

Cutting or trimming of plates and structural iron to shape.

Making man holes, port holes, patches, ventilator and funnel openings, stairway openings, mast openings and headlights.

Trimming stem and stern posts.

Cutting frames and "between rib" plates.

Cutting shafting, pipes, chains, rivets, and scrap.

The majority of these applications were made absolutely essential during the war in the speed-up schedule required through the time limit placed on production, a most interesting example being that of cutting port holes.

It had always been customary in shipyards to punch a large number of holes with a ½ or ¾ inch punch around the periphery of the proposed port hole. The central portion, or plate, was in this manner removed and the edges then trimmed by means of a chipping hammer. An average of one and one-half hours was required to make in this manner a 12-inch diameter port hole, whereas with an oxy-acetylene circular cutting blowpipe and a simple attachment the port holes were, during the war, and are now completed in an average time of five minutes each. This not only shows a considerable saving in time and cost in doing the work, but it can also be said that the finished port hole as made by the oxy-acetylene cutting process, is better in appearance than that of the older process.

The process had been for years applied to the cutting of armor plate, but during the war the increased efficiency of heavy ordnance made it absolutely essential to increase the thickness of armor plate used on battleships and sea coast defenses. The oxy-acetylene process took care of this increased cutting limit in many instances in the manufacture of new armor plate. As a result of the change of armor due construction made necessary by the war, Government proving grounds, such as that conducted at Aberdeen, Md., were called upon to test, seemingly without limit, all kinds of armor plate. After this plate had been hit by several shells it was, of course, only suitable for further use as scrap. The question, however, was to reduce it to handling size so that it could be remelted. A specific example of this can be quoted from work done at the Pittsburgh Crucible Steel Co., Midland, Pa., where thousands of tons of this scrap armor plate, averaging 16 to 17½ inches in thickness, was cut by the oxy-acetylene process. Working cost showed the actual cutting of this material at the very low figure of 1⅜ cents per square inch and the wonderful speed of 3 lineal inches cut per minute. This speed is the more remarkable when one stops to consider the high percentage of chrome and nickel contained in armor plate.

Shortly after the United States took up arms against Germany, contracts were placed with numerous steel foundries throughout the country for castings to be used in the construction of naval and field guns. One of these castings, called the gun slide, is most difficult to manufacture. It has a trunnion or projection of metal on each side, which is very heavy compared to the walls of the casting, and in order to eliminate shrinkage and cracking when the casting cools, the trunnion has to be carried clear across the casting. After the casting is cooled that part of the trunnion that passes the bore of the casting in which the gun rides has to be removed, and as the bore is circular, about 12 or 14 inches in diameter (varying with the size of the gun), to remove this part by machine would be very slow and costly, so that a number of foundries used to splendid advantage the Staybolt, oxy-acetylene cutting blowpipe, for removing the surplus metal. Such companies as the Superior Steel Casting Company, West Steel Casting Company, the Linderman Steel Machinery Company, and the McCord Company used the process, securing a good, smooth cut without injury to the walls. The time saving, as compared with older methods, was a tremendous factor in the speed of production.

Essential application of the character already given might be continued without number, such as the application made by the Illinois Steel Company, of South Chicago, in cutting torpedo heads by means of the blowpipe, or of the work done by the Radiograph and the Oxygraph in cutting irregular steel shapes, but further remarks in the paper will be confined to what was probably the greatest example of the application of oxy-acetylene cutting made during the war, namely, the nicking of steel bars for the producing of shrapnel and high explosives or gas shell cases.

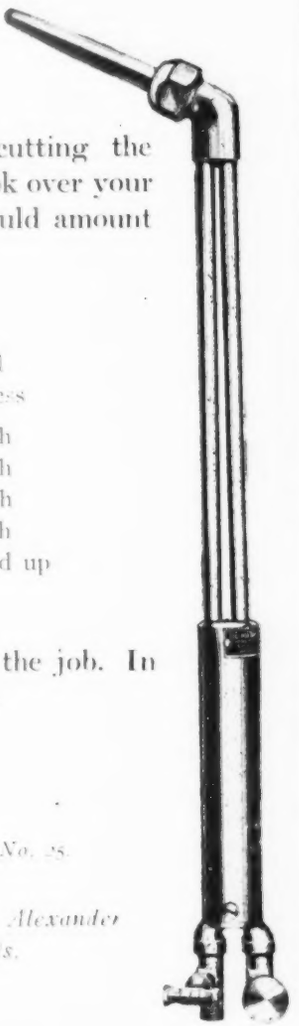
Long before the Armistice was signed, many large plants in this country were engaged, in whole or part, in the making of shell cases and the final overwhelming superiority of the Allies was undoubtedly due to the unlimited supply of artillery and artillery ammunition. It is a well known Ame-

†Read before International Acetylene Association, New York, July 15-17, 1919.

*Vice-President, Oxweld Acetylene Co.

Saving Oxygen is Real Economy

The Milburn Quick-Weld Torch welds on equal pressures of oxygen and acetylene. On heavy welding the amount of oxygen used is just half that demanded by old style torches, which makes it the most economical torch on the market.



Oxygen is an expensive part of any welding operation. By cutting the oxygen consumption in half you cut down your welding costs. Look over your last month's oxygen bills—and figure what a 50 per cent saving would amount to. The chart tells the story.

Tip Number	Working Pressures		Metal Thickness
	Oxygen	Acetylene	
6-J	3 lbs.	3 lbs.	¼ inch
7-J	4 lbs.	4 lbs.	⅜ inch
8-J	6 lbs.	6 lbs.	½ inch
9-J	7 lbs.	7 lbs.	¾ inch
10-J	7 lbs.	7 lbs.	1 inch and up

The Milburn Quick-Weld does not save oxygen at the expense of the job. In fact, it produces quicker more perfect work than old style torches.

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Agencies Throughout the United States and Canada

saying that, "He who has the better artillery wins the battle," and especially was this true in the World War.

The United States Government had for some years made shells of various sizes in some of its arsenals, and, in addition, a few large steel companies, such as Bethlehem and Midvale had Ordnance Departments previous to the war. When the appeals and orders from France, England, Russia, etc., commenced to reach the steel and forge men of America a mighty upheaval took place. Large plants in all sections of the country turned from making bolts, nuts, air brakes, cars, machinery, etc., to the more urgent necessity—shells.

In the making of steel shell cases it had always been customary to take the long bars of shell steel as they came from the large rolling mills and by means of power driven saws with teeth of high speed steel cut them into billets or slugs, so that the forging might then be made, the machining accomplished and the shell case assembled into the finished death carrying shrapnel.

Such companies as first entered into this new work during the years 1916 and 1917, for example, National Tube Company, McKeesport, Pa.; Bartlett-Hayward Company, Baltimore, Md.; Barney & Smith Company, Dayton, Ohio; Milton Manufacturing Company, Milton, Pa., and the Tennessee Coal, Iron & Railroad Company, Birmingham, Ala., realized immediately that if the tremendous production asked for was to be obtained that some other method of cutting bars and billets would have to be found which could be easily and quickly applied, and which would be so fast that the big forging presses would not be idle a moment for lack of slugs.

Oxy-acetylene cutting just naturally filled the gap, as no other method could, and the wonderful production figures, as given below, were attained in the majority of the hundred or more plants engaged in this work:

Diameter of bar	Billets per 8-hour day per operator	Average depth of nick	Average cost per slug of nicking, including gases, labor and breaking
$3\frac{5}{16}$ inches	2,000	$\frac{1}{4}$ inch	1.55 cents
$5\frac{3}{16}$ inches	800	$\frac{3}{8}$ inch	4.8 cents
9 inches	250	$\frac{3}{4}$ inch	7.5 cents
$11\frac{1}{4}$ inches	100	1 inch	20. cents

Hot saw or friction saw nicks gave only about one-quarter of these production figures, while the cost was more than double that of the oxy-acetylene method. It was also found that nicks made by the oxy-acetylene method doubled the number of good breaks, as compared with the saw method. In addition, nicks made by means of saws did not break as close to the vertical plane or with as good a fracture as the bars nicked by oxy-acetylene method. These two latter points were of special interest to the manufacturer, first, because with the clean break the forgemen were enabled to place the billet directly into the die as it came from the breaking press or hammer, and without difficulty center the piercing punch, and, secondly, through the securing of a clean fracture inspection of the steel by Government employes was greatly facilitated.

When the process was first applied for the nicking of steel bars, the groove, or nick, was made to considerable depth and over the entire circumference of the bar. As time went by and the knowledge of experience was secured, the nicking depth was decreased and the cut was made usually over one-third of the circumference. No additional weight or power in the hammer or breaking press seemed to be necessary, and the breaks were even better than when the whole circumference had been nicked. The increase in speed and the decrease in cost were, of course, items of interest, especially to the larger manufacturers, where production of twenty-five to thirty thousand slugs per day was maintained as an average. Naturally various methods of holding the hand, or machine type, cutting torches used in this application were originated by the various users. Many of these devices were unique, but the majority were simple in character and made provision primarily for the holding and position adjustment of the blowpipe.

The majority of the installations consisted of Dissolved Acetylene Generator, Oxygen Manifold, and the required number of Hand or Machine Type Cutting Stations to give the production required.

The process was also applied in some cases to the trimming of the shell edge after machining of the outer and inner surfaces, thereby increasing the speed of this operation, as compared with the ordinary cutting off toll in the lathe by over 50 per cent. A similar application was also made of removing the nubbin or small end remaining at the nose of the shell case after machining in the lathe had been completed.

During 1917 and 1918 many large concerns took up the manufacture of shells, and practically without exception, the oxy-acetylene nicking process was used to secure the large production demanded in their contracts. More prominent among those who did work of this character are the following:

New York Air Brake Co., Watertown, N. Y.
American Can Co., Edgewater, N. J.
American Steel Foundries, Chicago, etc.
Milton Mfg. Co., Milton, Pa.
National Tube Co., McKeesport, Pa.
Twin City Forge & Foundry Co., Stillwater, Minn.
Worthington Pump & Machine Co., Jeansville, Pa.
Penn. Seaboard Steel Co., New Haven, Conn.
American Motor Truck Co., Newark, Ohio.
Hartlette Hayward Co., Baltimore, Md.
Hewitt Steel Co., Newark, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Williams, White & Co., Moline, Ill.
American Rolling Mill Co., Middletown, Ohio.
William Wharton, Jr., Co., Easton, Pa.
Ingersoll-Rand Co., Phillipsburg, N. J.
Crucible Steel Co., Harrison, N. J.
Central Steel Co., Massillon, Ohio.
Detroit Steel Castings Co., Detroit, Mich.
Standard Forgings Co., Indiana Harbor, Mich.
Bethlehem Steel Co., Steelton, Pa.
Barney & Smith, Dayton, Ohio.
Curtis Mfg. Co., St. Louis, Mo.
American Tube & Stamping Co., Bridgeport, Conn.
Laconia Car Works, Laconia, N. H.
E. W. Bliss & Co., Brooklyn, N. Y.

Reference has been made in this paper only to the application in production work, but we must not forget the thousands of applications which were made in the maintenance of plant equipment in conjunction with the oxy-acetylene welding process, thereby keeping producing equipment at top notch speed. The further use of the process in such special applications as the cutting of steel lake steamers into two sections, so that they might be passed through the Welland Canal on their way to the ocean to do their bit in carrying the boys across to France—the application made by the English in removing sections of submarines or other vessels in order to allow the release of imprisoned persons and it is further rumored that the Germans used the oxy-acetylene cutting process in the destroying of artillery which they had to leave behind in their flight. Can we not, therefore, in true justification state that the oxy-acetylene cutting process must be, and is, recognized as one of the decisive factors in the winning of the war?

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EXCLUSIVE TERRITORY is now being apportioned. We have given preference to the wide awake dealers of gas apparatus who have seen the arc as the inevitable master of the welding field, because acquaintance in the field plus the knowledge of the arc as the "ultimate welding medium" assures orders. We do not, however, limit ourselves in this regard.

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OXY-ACETYLENE PROCESS AT NEWPORT NEWS*

By H. I. Walsh†

Mr. President and Gentlemen of the International Acetylene Association: I feel deeply honored at being with you, and sincerely hope that what I say may be of some benefit, and interest, to those present, and to the Welding Industry at large.

I have been requested to state the uses to which oxy-acetylene has been applied in ship construction. In order to do this with a certain degree of intelligence I will confine my remarks to the uses to which it has been put in the plant by which I am employed. I believe by doing this that I will be better able to convey the information desired, as we are doing a little more than the average shipbuilding plant does.

To begin with, we have a Welding Department that stands alone. By this I mean it is not attached to nor does it form a part of any other shop or department. All welding in our yard comes under the direct supervision of the welding foreman, and he is held responsible for all welding or cutting done on new or repair work.

We have in this department a complete acetylene, generating and compressing plant, consisting of three 300-pound generators, gas holders, dryers, purifiers, compressors and one hundred and fifty 225-foot and ten 100-foot acetylene cylinders. The acetylene cylinders are distributed throughout the yard on shipways, in shops, dry docks and on ships undergoing repairs throughout the harbor.

At the Angle and Beam Shops we have a 300-pound generator, and both the main and auxiliary shops are piped for acetylene and are now being piped for oxygen.

Our oxy-hydrogen plant consists of one hundred and one cells, producing four hundred feet of oxygen and about eight hundred feet of hydrogen per hour, two 5,000-foot gas holders, oxygen and hydrogen compressors, five hundred 200-foot cylinders, two tanks for oxygen, 1,000 feet capacity each at 350 pounds pressure, and two for hydrogen. The hydrogen, however, is mostly waste at present, but we anticipate using it for cutting at the Scrap Yard, Foundry, Forge Shop and in other places where it can be used to advantage, safety and efficiency being considered paramount.

All gas plants are working twenty-four hours per day, six days per week, and we also purchase from the open market three hundred 220-foot cylinders of oxygen per week.

The Welding Shop is equipped with all modern appliances for handling welding jobs, such as brick furnaces, portable and electric hoists, cast slabs and welding tables.

Oxygen, acetylene, hydrogen, city gas and low and high pressure air are all piped into this shop.

Hydrogen is used also for pre-heating castings instead of city gas or charcoal.

We are at present employing about forty acetylene welders and one hundred and twenty-five cutters.

At the Angle and Beam Sheds, fifteen acetylene welders are employed regularly welding frames, staples, rings, and in fact, anything that is to be welded, which enters into the construction of a modern ship.

The anglesmith of today has little else to do but bend to shape the material he is working, as the welders do most of the cutting and all of the welding. Six men are kept constantly busy doing Smith Shop work, new and repair.

The fittings and parts that are forged and which have

*Paper read before the International Acetylene Association, New York, July 15-17, 1919.

†Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

Equipment for All Purposes

CUTTING TORCHES which use any preheating gas.

INJECTOR TYPE WELDING TORCHES

EQUAL TYPE WELDING TORCHES

REGULATORS THAT REGULATE

TORCHES MADE SPECIAL FOR GAS MANUFACTURERS

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AUTOMOBILE WELDING

With the OXY-ACETYLENE FLAME By M. Keith Dunham

167 Pages **Price $1.25** *Fully Illustrated*

This is the only complete book on the "Why" and "How" of Welding

Explains in a simple manner apparatus to be used, its care, and how to construct necessary shop equipment. Proceeds then to the actual welding of all automobile parts, in a manner understandable by everyone.

Gives principles never to be forgotten. Aluminum, cast iron, steel, copper, brass, bronze and malleable iron are fully treated, as well as a clear explanation of the proper manner to burn the carbon out of the combustion head.

Automobile Owners, Garage and Service Stations, Blacksmiths and Machine Shops, as well as industries using the oxy-acetylene flame, will find this book of the utmost value, since the perplexing problems arising when metal is heated to a melting point are fully explained and the proper methods to overcome them shown.

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mean highest efficiency and economy in cutting and welding operations. The presence of inert elements in your oxygen or hydrogen slows up the process and results in unsatisfactory work. Electrolytic oxygen and hydrogen, commercially 99.5% and 99.7% pure respectively, or better, are wholly free from inert impurities. Their use will give you an advantage of 25% to 45% in increased efficiency over the plant that uses gases made by some inferior process. Isn't this worth looking into?

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National Oxygen Co., Chicago
Acme Oxygen Co., Chicago
Burdett Oxygen & Hydrogen Co., Chicago
Electrox Co., Peoria
Swift & Co., Chicago

INDIANA
Indiana Oxygen Co., Indianapolis
Logansport Oxygen Co., Logansport

IOWA
Bettendorf Oxygen Hydrogen Co., Bettendorf

KENTUCKY
Kentucky Oxygen & Hydrogen Co., Louisville

MICHIGAN
Michigan Ox-Hydric Co., Muskegon
National Oxygen Co., Detroit
Burdett Oxygen Co. of Detroit, Detroit

MISSOURI
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Ohio Electrolytic Oxygen Co., Cincinnati

OKLAHOMA
Burdett Oxygen Co. of Oklahoma, Oklahoma City

OREGON
Portland Oxygen & Hydrogen Co., Portland

PENNSYLVANIA
International Oxygen Co., Verona
Burdett Oxygen Co., Philadelphia (Plants at Chester & Norristown)
Burdett Oxygen & Hydrogen Co., Pittsburgh

TENNESSEE
Burdett Oxygen Co., Chattanooga

TEXAS
Burdett Oxygen Co. of Texas, Ft. Worth

UTAH
Whitmore Oxygen Co., Salt Lake City
Utah Burdett Oxygen Co., Salt Lake City

WASHINGTON
Washington Burdett Oxygen Co., Seattle

WISCONSIN
Universal Oxygen Co., Sheboygan

GAS PRODUCTS ASSOCIATION

801 Marquette Bldg., Chicago, Ill.

to be welded are done either by the electric or acetylene process, and all parts that have been heretofore worked in the fire after being welded are now being done by acetylene.

In the Boiler Shop and Sheet Iron Department, welders are kept busy on such work as angles, tanks, uptakes, hatches, smokestacks, ventilators, etc., new and old castings of brass, iron, steel and aluminum; copper, brass, steel, iron and cast iron pipes and plates of all sizes and shapes are being successfully welded. In fact, we are now welding anything that can be welded, from delicate parts of coin counting machines to castings weighing from ten to twelve tons.

Our Yard, as a whole, is one of the best equipped in this country. We are building engines, boilers and ships complete, making our own billets and forge any size pieces which are required in the plant.

All cutting at the Foundry and Forge Shops is now being done with either the acetylene or hydrogen torch. We cut through anything up to 24 inches in diameter.

In boiler and ship repair work we are showing a saving of approximately 100 per cent in time and cost over the old methods. Cutting out plates, rivets, tubes and stay bolts, also the welding of patches and cracks in boilers and tanks, broken and worn parts of all kinds of machinery from the wireless fittings to main engine cylinders and bed plates.

The acetylene torch has supplanted the old charcoal basket and oil burners for heating bent frames, bilge keels, stems, stern posts, shell plates and propeller blades. We have successfully welded quite a number of patches on bronze, cast iron and steel blades.

Since the armistice was signed, hundreds of gun platforms have been removed from our Supply Transports by cutting torch in a very few hours and without delaying the ship. This could not be done by any other method, time and cost being considered.

The cutting up of boilers and other scrap that naturally accumulates around large shipbuilding and repair yards and the salvaging of parts that can be used again is done quicker, cheaper and neater with the torch than by any other known methods.

I regret very much that I am not able to furnish slides showing the different kinds of difficult jobs that have been done with the acetylene torch at our plant, due to the fact that during the war it was strictly against the rules of the Government and our company to make pictures of any work being done.

If any of you gentlemen present are interested to the extent of making a trip to our yard at Newport News, Virginia, it would afford me great pleasure in showing you what welding we are doing.

At the beginning of the war, the Commanding Officer of the Port of Embarkation, at Newport News, requested our President, Mr. Homer L. Ferguson, to allow certain men from the Motor Truck Companies, stationed at Camp Lee, the privilege of working at the yard, in order that they might be benefited and gain some knowledge of our methods of welding. This request was cheerfully complied with, and I am proud to say that in a comparatively short time we made first class welders of a number of them, and they kept hundreds of automobiles and trucks in service when they were most needed.

During the training of these soldier welders, all of the broken parts were brought to the shipyard and done by these army men (or our welders, if it was a very difficult job), and at no cost to the Army.

We kept all of the camps in and around our vicinity supplied with both oxygen and acetylene and other material of this class if needed.

It is my candid opinion that the Welding Industry, as a whole, has done more toward keeping the steady flow of men and supplies on their way to Europe than all the other methods of construction and repairs used in the country.

My last statement is quite broad, but I am thoroughly honest in my conviction that this is true.

I thank you for the opportunity afforded me for these remarks, and sincerely trust that they may be of some interest to the Welding Industry.

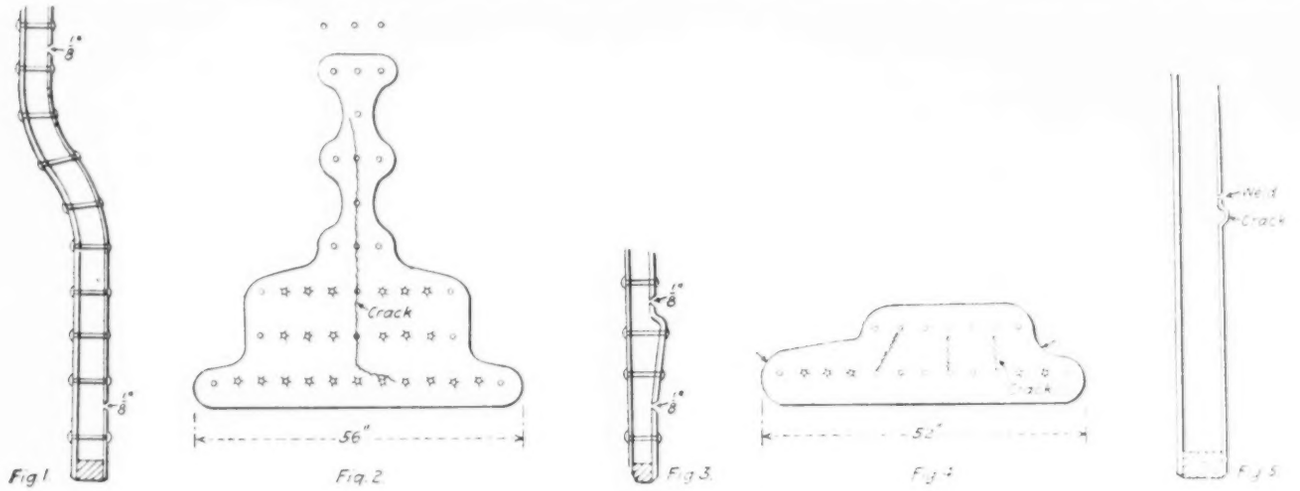


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5

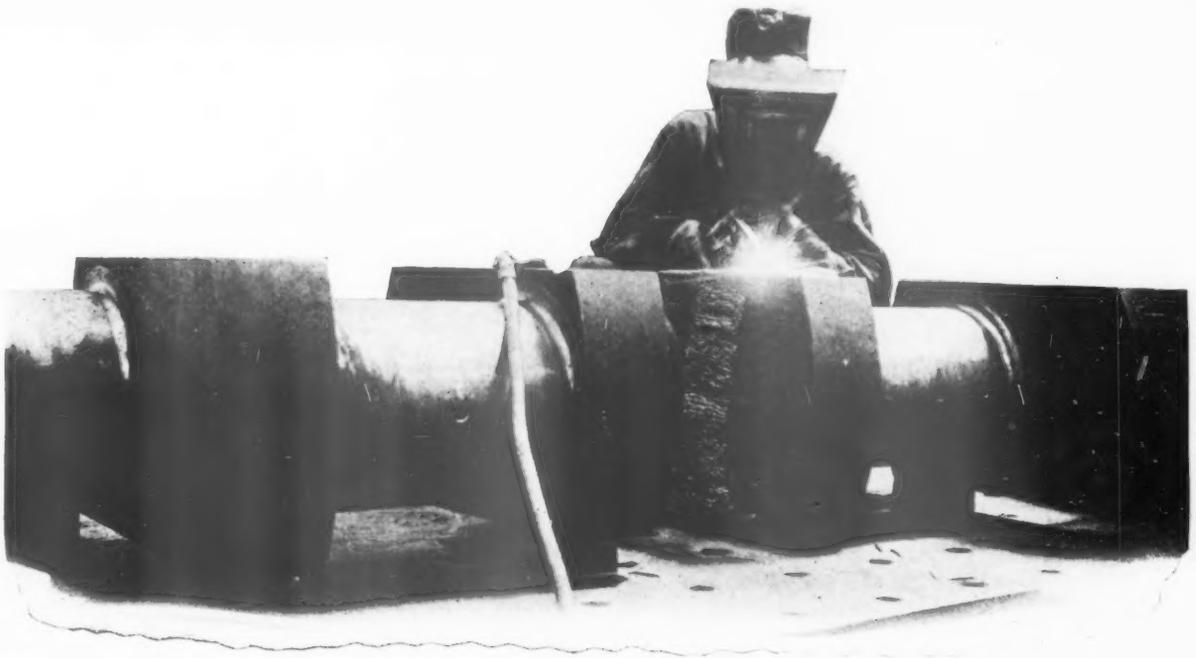
Electric Welded Patch.

ELECTRIC WELDED PATCHES

The subject of welding locomotive boilers is one of great importance, and various methods of welding patches have been used with success. When patching side sheets the writer has used the electric weld and applied the patches as illustrated.

In the drawing, Fig. 1 shows a patch applied to the right side sheet of a heavy switch engine. The shape of the patch is as shown in Fig. 2, which also shows the crack that had developed in the side sheet.

Figs. 3 and 4 show the shape and application of a patch on the left side sheet of the same engine. This patch was offset 1¼ inches at the top and tapered down to the points indicated by the arrows in Fig. 4. This offset has been found preferable to that shown in Fig. 5, which not only gives trouble at the weld, but frequently cracks in the offset



Plastic-Arc Welded

Which means that this unusually heavy welding job (a six-ton crank shaft) was done at the lowest possible cost, without preheating and with perfect assurance that it would be mechanically sound and the shaft true when the job was finished.

Plastic-Arc outfits maintain a constant critical heat at the weld, by means of a fixed voltage and an automatically maintained current, the latter being an exclusive feature of this system of welding. This constant heat insures thorough fusion of the original and added metal, consequently mechanically sound welds.

This applies to all jobs, of practically all metals, regardless of size or bulk.

A **Plastic-Arc** outfit should be part of the regular equipment of every welding shop because it will make mechanically sound welds on practically any metal without preheating at a lower cost than any other methods or systems of welding.

Write for further details.

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The stars in Figs. 2 and 4 indicate staybolt holes which were so badly fire cracked that it was necessary to remove that portion of the side sheet.

Both of these patches were fitted in place with the edges of the patches and side sheets beveled to about 30 degrees, with ⅛ inch clearance all around, as shown in Figs. 1 and 3. The staybolts were then applied, and the patches electric welded to the side sheets.

The welding was done by an operator who had had only a few hours' instruction from an experienced welder, and considerable doubt was expressed that this method of patching would prove to be satisfactory. After three months of service, however, there has been no sign of failure or even sweat at the weld.—*Railway Mechanical Engineer.*

BUILDING UP A WORN PUMP WITH THE OXY-ACETYLENE PROCESS*

The type of centrifugal pump used by dredging contractors and mining operators for such purposes as dredging silt, sand, mud and gravel from the bottoms of channels and for mining soft ore by the hydraulic mining system, is subject to excessive wear, due to the constant abrasion of the sand and gravel against the inner walls of the pump chamber. When the wear becomes so great as to interfere with the operation of the pump, or "sand sucker," as it is commonly called, it becomes necessary not only to put the pump itself out of commission for repair, but also to hold an expensive dredging barge and its crew in idleness.

Such a sand sucker chamber that had become badly scored through use was recently restored to practically its original condition by the Chicago Job Welding Department of the Oxweld Acetylene Company, by means of the oxy-acetylene process. When it is considered that new castings would have cost about $3,500 and that the actual cost of repairing by welding methods amounted to only one-third as much, it is not surprising that the contractor decided to repair instead of to replace, especially in view of the still more important fact that repairing enabled him to get the dredge back into service with only a few days delay, whereas replacement meant a delay of from 10 to 12 weeks.

From Engineering Department, Oxweld Acetylene Company, Chicago, Ill., and Newark, N. J.

Delay Meant Great Loss

In order to gain some idea of the cost of delay of a hydraulic dredging outfit an estimate of the earnings of a dredge will be given. In the year 1912 the United States Government estimated the cost of hydraulic dredging to be 7.18 cents per cubic yard. This figure represented the average total unit cost of operating a fleet of hydraulic dredging vessels. The record for one month for one dredging pump having a 20-inch outlet pipe was 456,000 cubic yards of material. At the average unit cost given above, the monthly cost of dredging this amount of material represents over $30,000. The sand sucker shown in the illustrations is much larger than the one referred to above. Furthermore, the cost of materials and labor is much greater today than in 1912. When such factors as loss of profits, overhead expenses, non-productive labor and contract penalties are taken into consideration, obviously every week of idleness meant a loss of thousands of dollars.

Over Half a Ton of Metal Deposited

The pump chamber of the sand sucker illustrated is 11 feet in outside diameter, and consists of two massive steel castings have a total weight of 7 tons. The abrasion had been so severe it was necessary to rebuilt both side walls of the pump chamber for a distance of 8 inches from the inner circumference. The thickness of the added metal

Can You Use a Returned Soldier-Welder?

The Bureau for Returning Soldiers, Sailors and Marines, 120 West Adams Street, Chicago, has directed our attention to the fact that the Bureau has registered a number of men, experienced welders, who are in need of positions. The names of these men are given below. If you are in need of a welder communicate with one of them.

Name	Address and Phone	Experience	Last Worked For	Last Wage
Joseph Rutt,	2600 W. 24th St.	3 years,	American Car Foundry Co.	85c hr.
Bernard Julian,	356 So. Homan Ave.	4½ years,	American Bridge Co.	$36 wk.
Arthur H. Brauer,	1316 Washington Blvd.	1 year,	Chicago Pump Co.	60c hr.
J. P. Stanton,	General Delivery.	1½ years,	American Dist. Steam Co.	$200 mo.
Geo. S. Baker,	2031 W. 20th St.	3 years,	McFarland Hide Co.	$7.50 dy.
G. E. Lidecka,	238—12th St., Maywood, Maywood 1083-J	2½ years,	Oxweld Acetylene	$35 wk.
Paul Antisdel,	6647 Yale Ave.	2 years,	Clark Tool Equipment Co.	40c hr.
Theodore T. Pye,	3354 Walnut St.	4 years,	Standard Oil Co.	60c hr.
Robert Jones,	225 S. Racine Ave.	2 years,	Imperial Brass Co.	55c hr.
F. Grameman,	6420 S. Sangamon St.	5 years,	Chicago Junction R. R.	54c hr.
Wm. Burke,	7720 Normal Ave.	4½ years,	Lally Column Co.	$18 wk.
G. H. Dandurand,	924 Montana St.	1½ years,	Konstini Co.	$30 wk.
Ben Kasper,	4755 S. Lincoln St.	2 years,	American Car & Foundry Co.	45c hr.
W. J. O'Connell,	6148 Greenwood Ave.	7½ years,	Kenwood Bridge Co.	56c hr.
John Cernevicz,	1423 S. 48th Ave.	3 years,	Winslow Bros.	$18 wk.

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You can't afford to use less than the best facilities in your repair work. Imperial Welding and Cutting Equipment is first in Safety, Speed, Economy and Efficiency. Its maintenance cost is low because of the small gas consumption, and a single operation often pays for its cost.

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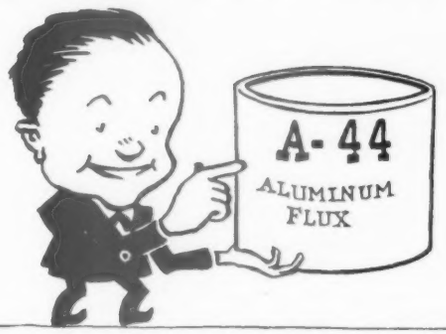

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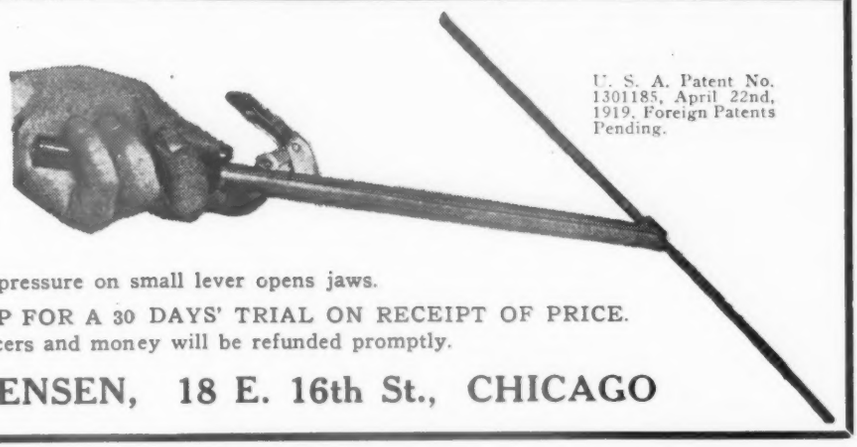
MODEL 3
Price, $1.00—3 for $2.50

Length, 16 inches. Weight, ½ pound. Holds the welding rod rigid at angle shown.



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A slight pressure on small lever opens jaws.

SENT TO ANY WELDING SHOP FOR A 30 DAYS' TRIAL ON RECEIPT OF PRICE.
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Jobbers and Agents, write **C. SORENSEN, 18 E. 16th St., CHICAGO**

Campbell's "Oxy-Acetylene" Welding Manual

By Lieutenant Lorn Campbell, Jr.
Ordnance Corps, U. S. A.

Lieut. Campbell organized and conducted the Army Welding School at Peoria, Ill. His new manual is based on his experience there, in training soldier welders. 154 pages, 89 illustrations, bound in cloth, $1.25.

THE WELDING ENGINEER
Chicago, Ill.
608 S. Dearborn St.,

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I. Apparatus.
II. Operation.
III. Shop Equipment.
IV. Apparatus repairs.
V. Preheating Agencies.
VI. Part One—Welding of Cast Iron.
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varied from 1½ to 2½ inches. In addition, a new section approximately 14 by 18 inches in area had to be welded into the throat of the casting. The latter was approximately 3½ inches in thickness.

In order to insure holding the two halves of the chamber in alignment during preheating and welding they were bolted together and the heavy outer reinforced sections of the castings were not heated, as this would have produced internal strains, either breaking the castings or shearing the bolts that held them together. Preheating by means of charcoal was applied locally for a distance of about 14 inches in from the edges of the flanges, each preheat extending for a distance of 3 feet around the inner circumference.

The total weight of steel added to the castings by welding amounted to 1,264 pounds. The operators, each using an Oxweld blowpipe fitted with No. 15 welding head, worked in pairs. As the heat in the small enclosure where the men worked was intense, it was necessary to hold several welders in reserve and to work on the relay plan, each welding shift extending for a period of 20 minutes. Six days were required to complete the building-up work.

AN UNUSUAL WELDING REPAIR JOB

An unusual welding repair job, which required high engineering ability and skill to successfully handle, was that

Fig. 1. The Break.

of a broken six-ton crankshaft, which was broken through the web, as shown by Fig. 1.

This shaft was part of the equipment of the Houston Ice

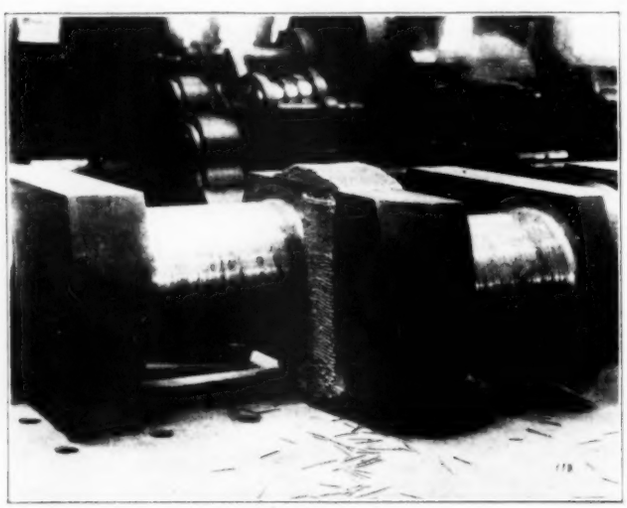

Fig. 2. Lined Up.

Brewing Company, Houston, Texas but as repairs could not be made in that section the broken shaft was shipped to the Jersey City, N. J. plant of the Vulcan Iron Works, where it

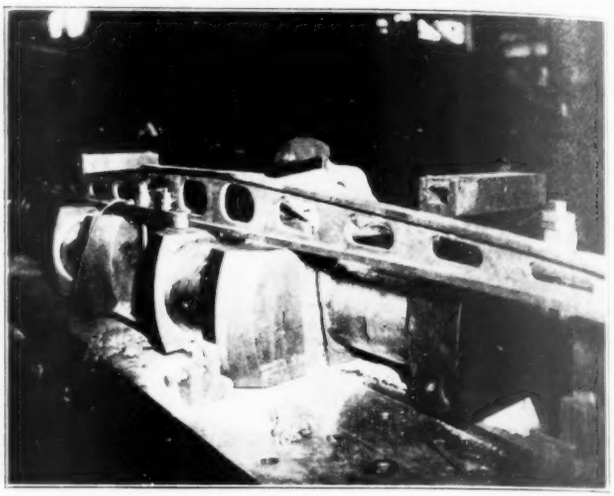

Fig. 3. Finished Weld.

was repaired by welding by the Wilson Welding Repair Company, using a Plastic-Arc Outfit.

The greatest difficulty was insuring proper alignment of the shaft at the conclusion of the work. The shaft was clamped to the table, and lined up as shown in Fig. 2, and the welding proceeded after the metal of the break had been chipped out to insure a clean surface for the added welding metal to fuse with.

The job as finished is shown in Fig. 3. When the welding was finished the shaft was tested in a large lathe and found to be entirely true from end to end.

OXYGEN DELIVERIES

The importance of "Accessibility" in the oxygen business is strongly emphasized in the construction by the Air Reduction Sales Company of new plants at Richmond, Va., and Boston, Mass. These plants, which have been built and equipped according to the most modern thought in this

field of construction, form two more links in the chain of Airco service stations throughout the country.

Accessibility is an important element in the manufacture and sale of oxygen. The varying demands for the application of the oxy-acetylene process and the consequent fluctuation in gas requirements—plus the high freight rates in force—make the question of supply the welder's chief consideration. He wants his source of supply as near as possible, so he can get his gas quickly, when necesary, and at the same time secure the benefit of low transportation charges.

The Air Reduction Sales Company has worked out its service plan so that not only has it a station available to every user, but what is also important, maintains a staff of expert welders, whose duty it is to place their services at the disposal of shops that have some particularly difficult welding or cutting problem to overcome, etc.

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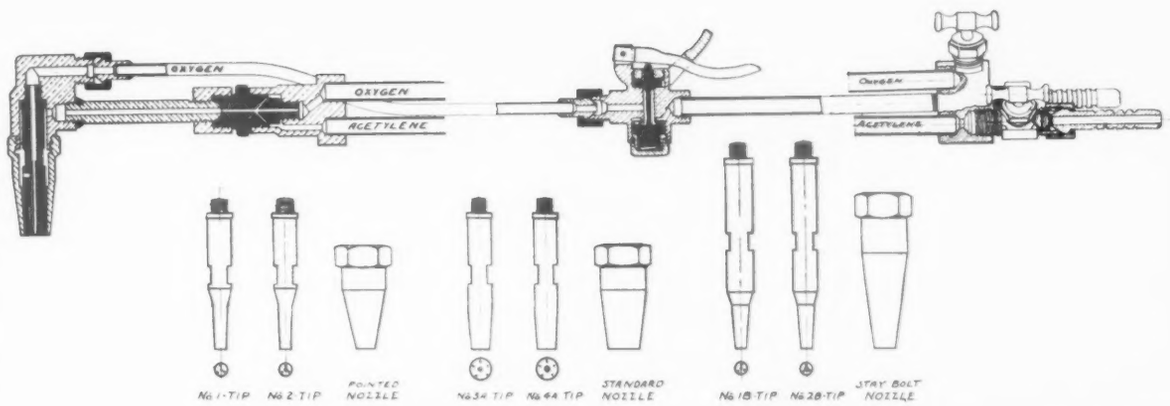

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Extra cover glasses in clear or amber tint..... .20 pair

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Help Wanted—25c per line, minimum 4 lines.
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Count 8 words to line. Add 6 words for keyed address.

Wanted—Salesman to solicit subscriptions to *The Welding Engineer*, or furnish names of possible readers. Compensation good. Correspondence confidential. Write Mackenzie.

FOR SALE: 200-lb. Low Pressure Oxweld Generator, with tank. In use only two months. As good as new. Best offer will be accepted. B. H. Voss, 74 East Fort St., Detroit, Mich. 1t-sep.

Wanted—Agencies for the sale in Italy of sheet metals, either mechanically made or by electricity, including tools or machine tools. First-class technical references and financial guarantees. Address Vittorio, 527 Hamilton Avenue, St. Louis, Mo. 1t-Sept.

Position Wanted—Mechanical Engineer. Cornell graduate. Several years' experience in shops of leading locomotive manufacturers. At present manager of highly successful job welding shop. Seeks connection with large manufacturer or welding equipment firm in an engineering or executive capacity. Address Cornell, care The Welding Engineer. 1t-Sept.

Foreman Wanted—First-class job welding foreman. Must know heavy work in both cast iron and steel; $200 per month to right man. Address Mackenzie, care The Welding Engineer. 1t-Sept.

Position Wanted—Have had experience with general welding in car barns. Last year in charge of sheet metal work. Want chance for advancement. Will go anywhere. Address Eric A. Ohlson, 30 Riverview Street, Brockton, Mass. 1t-Sept.

Position Wanted—Seven years' oxy-acetylene and two years' arc welding experience. Can demonstrate. Age 32; married. Address John H. Margel, 28 Twenty-first Street, Toledo, Ohio. 1t-Sept.

Position Wanted—First-class electrical welder with experience on both A. C. and D. C. machines desires position as foreman. Has had experience in ship and repair work, also as instructor in arc welding school. Possesses good education and is capable of handling men. Good references. M. F. Sheely, care Electric Arc Cutting & Welding Co., 222 Halsey St., Newark, N. J. 1t-Sept.

Soldier Wants Job—Former sergeant, Ordnance Corps, just returned from France wants job as welder. Have had plenty of experience. A. W. Davis, General Delivery, Lawrenceburg, Tenn. 1t-sept.

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To such a man we offer an exceptional opportunity.

In answering, state experience in detail, references and compensation expected. All answers will be held strictly confidential.

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A product of years of time and study. Over 98 per cent pure boron and is not attended by deposit or scale. Acts as a superior flux and purifies the brazing spelter, causing spelter to flow evenly into every part of joint, without deposit, scale or enamel. A trial will convince the experienced welder of the merits of Superior Brazing Compound.

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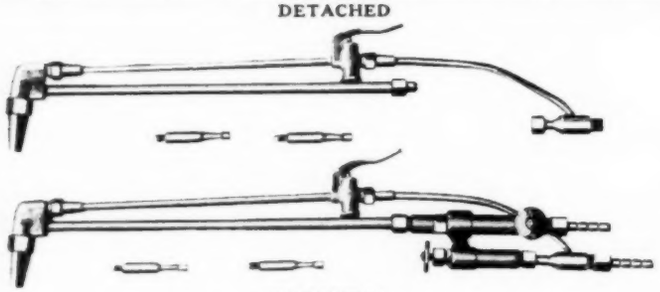

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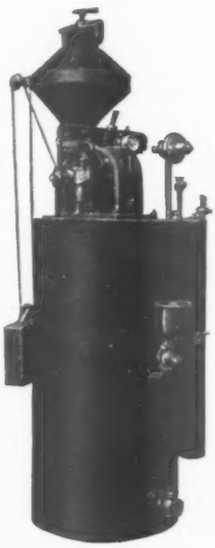

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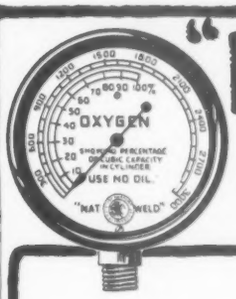

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THE PYROGRAPH.

The Pyrograph is the name of a new machine manufactured by the Davis-Bournonville Co., Jersey City, and which is a boiler shop cutting machine. It is useful for trimming and beveling boiler sheets to the correct flange height and calking angle in one operation. Copy of the bulletin describing this new machine will be sent upon request.

CIRCULAR SAWS.

Editor: In all lumber camps large circular saws, running at a speed of 650 revolutions are used and quite often teeth are broken off, and apparently there is no other way of repairing the saw except by welding. All the welders in this vicinity are seemingly up against a condition which is in part due to ignorance. As careful as one seems to be, breaks occur, for something seems to chill the steel in the meantime and causes the same tooth to break away again, perhaps ⅛ to 1 inch from the weld.

If through any of the more experienced welders in your vicinity you can give us information that will serve to remedy this difficulty we will appreciate the matter very much.

Reader.

Editor's Note: We would appreciate hearing from readers who have had experience with this class of welding.

L. B. M.

Mr. W. H. Bleecker, Jr., has been appointed district sales manager in charge of the "Armco" Department of the Chicago office of the Page Steel & Wire Co., with offices at 29 South La Salle Street. A branch office has also been opened in the Book Building, Detroit, Mich., and Canadian sales are being handled by Taylor & Arnold, Ltd., Montreal, Toronto and Winnipeg.

Mr. W. P. Brown, of Brown Bros. Welding Co., San Francisco, and Mr. John H. Janusch, of the Mare Island Navy Yard, have completed an automobile trip from the Pacific Coast to the Atlantic Coast and return. The purpose of the trip was to inspect welding plants in all large cities.

Mr. Charles F. Gessert, export manager, for the Davis-Bournonville Co., is making a six months' through South America.

ELECTROLABS EXPANDING.

The Electrolytic Oxy-Hydrogen Laboratories, Inc., announce the formation of a sales and manufacturing company under the name of the Electrolabs Co. This will give them an opportunity to increase their organization to meet the increasing demand of their business.

The Electrolytic Oxy-Hydrogen Laboratories, Inc., will continue in charge of the lavoratories and maintain a technical supervision over the work of the new company.

The general offices and works of both companies, have been moved from Dayton, Ohio, into larger quarters at 2635 Penn Avenue, Pittsburgh, Pa.

The facilities for production of the new plant will be many times greater than the old plant, and will make possible, even better deliveries than in the past.

The general sales offices are being continued at 15 William Street, New York City, and branch sales offices have been opened in the Morris Building, Philadelphia, and the Merchants' Exchange Building, San Francisco.

I. H. Levin continues in charge of technical and research work, and D. J. Tonkonogy in general charge of sales.

The Eighth Annual Safety Council will be held at the Hotel Statler, Cleveland, Ohio, October 1st to 4th. On Saturday, the 4th, the morning program will include the exhibit of the Metals Section, which includes a practical demonstration of welding and cutting, by J. Schleicher, of the Alexander Milburn Co., Baltimore, Md. Those present will be furnished with goggles, supplied by various manufacturers.

John U. Lee & Co., 8 Hutt Street, Spring Bank, Hull, England, are interested in improved American welding and cutting apparatus and will welcome literature from American manufacturers.

SAFE PRACTICES.

The National Safety Council has issued Bulletin No. 23, which is entitled "Safe Practices."

This pamphlet contains a general statement regarding welding and suggestions as to safe practices in the use of welding and cutting equipment, which if followed in daily use, will result in great benefit to the industry as a whole. These suggestions were compiled by the council in co-operation with the International Acetylene Association.

The National Board of Fire Underwriters has issued the 1919 edition of their regulations for the installation and operation of acetylene equipment, recommended by the National Fire Protection Association.

These rules were very carefully drawn up by the Underwriters, with the co-operation of the International Acetylene Association and should prove advantageous in all branches of our business.

ACETYLENE IN NEW ENGLAND.

The New England Insurance Exchange has, for many years, made a charge where permitted acetylene generators were installed inside so high as to be prohibitive.

This important insurance body gave the subject of inside installation of permitted acetylene generators consideration at one of its recent meetings and decided to remove this charge, thus bringing the New England states into conformity with all the northern and western part of the country. The date of removal becomes completely effective on September 1, 1919, and after that date, manufacturers of permitted acetylene generators will be given the same treatment in New England that they are accorded elsewhere. It is earnestly recommended that the utmost pains be taken by all manufacturers of generators to see that the installation of the generators is in strict conformity with the National Board rules and that every effort to safeguard acetylene in New England shall be made.

It is a great gratification that the persistent efforts of the association have at last borne fruit and it may be said with truth that had not the record of acetylene throughout the country been so excellent, the New England Insurance Exchange would not have changed this charge indefinitely

A RECORD IN CUTTING.

Employes of the Edwin Forrest Forge Co., East Oakland (San Francisco) claim for their plant a world's record in the matter of cutting steel. Walter Scharnitz handled the torch. He made a 23-inch deep cut on a large crank shaft in eight minutes. In sixteen minutes more the two additional cuts necessary were made. The work was done with a Victor oxy-hydrogen torch.

The Wilson Welding Repair Co., Ltd., 2 Rector Street, New York, have issued an attractive little booklet, the title of which is "Guaranteed Welding Repairs." A great many attractive illustrations are shown, many of which deal with repairs made to the German ships siezed by the Government.

The Atlantic Coast Line Railroad has had excellent success in welding spring bands by means of the oxy-acetylene process. The bands are formed to the required shape with a V-joint at one of the small sides. The operator welds five bands per hour, at an average cost of 30 cents each for labor and material. Forge welding formerly cost 57 cents each.

The Best for Welders

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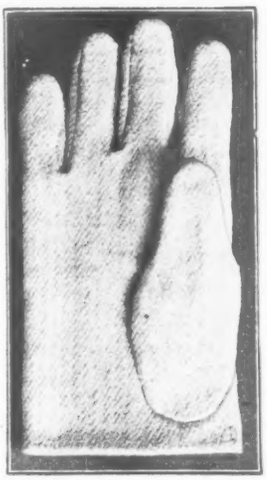

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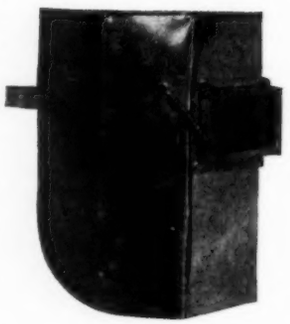

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The Latest Book on Welding

Oxy-Acetylene Welding and Cutting

182 Pages Fully Illustrated
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By P. F. WILLIS

Written by one of the oldest and most progressive authorities on the subject of welding. An up-to-the-minute text book, written for the purpose of giving the welder the greatest amount of information for the least possible cost. The third edition is now ready. Price, 75 cents.

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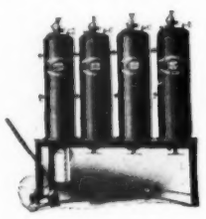

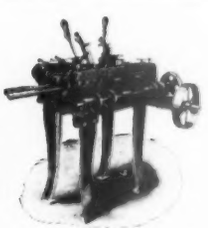

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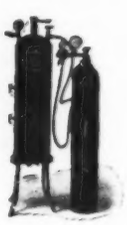

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AIRCO

WHERE HYDRAULIC PRESSURE FAILED

Two superheater flue sections tested in a hydraulic press for strength of weld. One section was bent at the welded joint. The other was subjected to a crushing test. In each case the Airco Weld showed no signs of cracking.

The Airco process should be used whenever a welding or cutting operation is necessary. Not only is a permanently strong construction obtained, but a great saving in time and money is made possible.

Accessibility of your oxygen and acetylene supply insures low freight charges and early receipt of the cylinders ordered. Airco Oxygen and Acetylene are shipped from a point near your plant.

AIRCO PRODUCTS

OXYGEN ACETYLENE

WELDING & CUTTING APPARATUS & SUPPLIES

NITROGEN-CARBIDE-ACETYLENE GENERATORS

AIR REDUCTION COMPANY, INC.

120 Broadway, New York City

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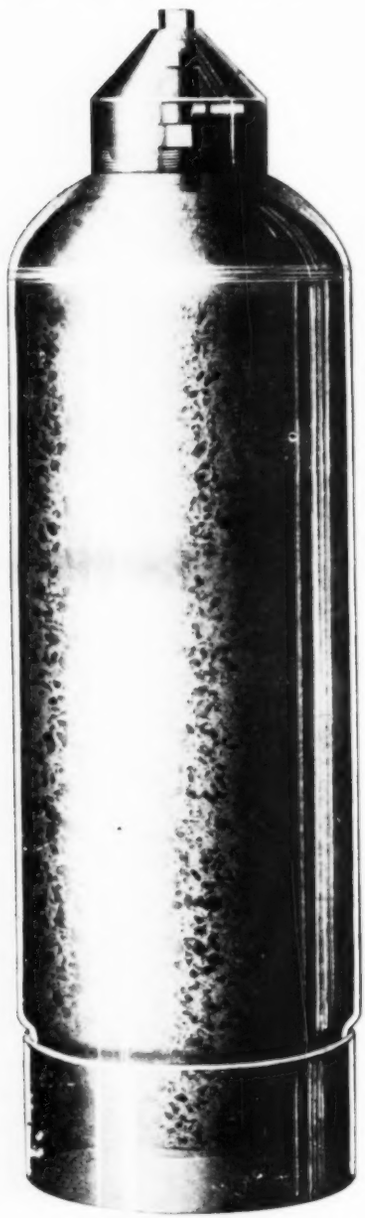
Dependable Acetylene

SINCE the introduction of the oxy-acetylene process into the United States Commercial Acetylene has possessed the merit to impress the welder with its dependability. Commercial Acetylene is always uniform and is the gas of greatest economy and efficiency.



The art of welding by the Oxy-Acetylene flame calls for the highest technique and skill and at every step great care and judgment must be used. The welder must center his attention on his work and to enable him to do this he must be furnished with a constant and uniform flow of gas of high efficiency.

Commercial Acetylene can always be relied upon. It comes in portable cylinders in several sizes.

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